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ABSTRACT

A project focusing on the assessment of the educational system in adapting people to technological change considered the problem of adaptation for the whole person, not simply the work role, but also the family, consumer, citizen, and other roles for which educational activity is potentially instrumental. There were two major objectives: Development of a formal theoretical framework by which the problem could be defined, and application of that theoretical framework in terms of the educational needs of several selected groups. The analytical framework emerged from the interaction of a multidisciplinary team and may be characterized as a formal treatment of role-theoretic concepts in social psychology, using the welfare-maximization techniques of microeconomic theory. The usefulness of this model of adaptation to technological change was explored in terms of the problems of adaptation to technological change faced severally by engineers (role conflict), physicians (role conflict), married women (role sequence), and the elderly (role loss). The model was useful in structuring a review of the literature relevant to each of the groups considered, but the paucity of literature posed a major difficulty. Little research has been conducted on the nature of the adaptation problems of these groups, the resources at their disposal, and the effectiveness of various educational interventions. In addition to the summary and introduction the report is in four chapters, each with its own bibliography: (1) A General Model of Adaptation, (2) Professional Obsolescence in Engineering and Medicine, (3) Technological Change and Role Sequences: Special Problems of Women, and (4) Problems of Adaptation Among the Elderly. (HD)

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THE ROLE OF EDUCATION IN FACILITATING ADAPTATION TO TECHNOLOGICAL CHANGE: AN ANALYTICAL FRAMEWORK AND REVIEW OF THE LITERATURE

PREPARED UNDER A GRANT FROM THE NATIONAL SCIENCE FOUNDATION

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PREFACE

This study was sponsored by the National Science Foundation, Office of R&D Assessment, as part of its research program on the socioeconomic effects of technological innovations. It focuses on the role of post-secondary education--especially continuing and adult education--in helping persons adapt to changes in technology. The necessarily broad scope of this study was enlarged further by the requirement that Rand consider the adaptation process as it relates to all areas of social behavior.

Because of resource limitations, the authors could not examine all of the subjects of potential relevance to their overall objective. Rather, they chose to focus on developing an analytical framework with which to define the general problem, and to explore the usefulness of this framework with selected, specific subject areas.

It was decided not to adopt human capital theory as an organizing framework for two reasons: (1) There was concern that this theory would tend to bias the study toward issues of adaptation within the labor force, thus frustrating the intention to consider noneconomic areas of behavior; and (2) the human capital literature is focused largely on measuring rates of return to training and experience. The use of such a theory would have been more compelling had the authors undertaken an empirical study of the effectiveness of education in facilitating adaptation to technological change. But human capital theory is less useful in a framework for defining and understanding the problems of adaptation per se.

The analytical framework of this report emerged from the interaction of a multidisciplinary research team. It may be characterized as a formal treatment of role-theoretic concepts in social psychology, using the welfare-maximization techniques of microeconomic theory. The authors desired to obtain a *model of adaptation* with the breadth of focus intrinsic to role theory in combination with the precision of economic analysis.

The usefulness of this model of adaptation has been explored in terms of the problems of adaptation to technological change faced

severally by engineers, physicians, married women, and the elderly. The model was useful in structuring a review of the literature relevant to each of the groups considered, but the paucity of literature posed a major difficulty. Little research has been conducted on the nature of the adaptation problems of these groups, the resources at their disposal, and the effectiveness of various education interventions.

Although there was considerable interaction among the members of the Rand project team, primary responsibility for the various chapters may be assigned as follows: Chaps. 1 and 2, Duran Bell; Chap. 3, Duran Bell and Joanne Wuchitech; Chap. 4, Pamela Rich and Joanne Wuchitech; and Chap. 5, Tora Bikson.

The authors of this report would like to acknowledge the inspiration provided by the program officers from the National Science Foundation, Barbara Burns and Rolf Piekarz, who were willing to offer the project team an opportunity to explore a broad and difficult subject.

The authors have had the guidance and advice of John Pincus, who directs Rand's Education and Human Resources Program, and Anthony Pascal, director of Resource Studies. Mary Rudolph acted as project librarian with great efficiency and élan, while Michelle Hunley and Mary Jane McMullan, among others, offered painstaking assistance in manuscript preparation.

SUMMARY

THE FRAMEWORK

This project focuses on the assessment of the educational system in adapting people to technological change. In this endeavor we considered the problem of adaptation for the whole person, not simply the work role, but also the family, consumer, citizen, and other roles for which educational activity is potentially instrumental. The accomplishment of this mission had two aspects:

1. Development of a formal theoretical framework by which the problem could be defined.
2. Application of that theoretical framework in terms of the educational needs of several selected groups.

The theoretical framework features *obsolescence*, defined as a time-dependent loss of effectiveness in some activity due to relative losses in one's level of knowledge and/or relevant resources. Obsolescence is a critical force that has its basis in technological change, at least part of its solution in educational activity, and is construed to affect a person in the many roles that define a person's behavior. Indeed, we find that the problem of obsolescence, with respect to each and every role, is a major underlying factor affecting individual adaptation to technological change.

In the context of technological change, obsolescence in role performance can be avoided only by commensurate increases in *resources* and *knowledge*. Such increases in role-relevant resources and knowledge are costly in terms of the *time* required to generate them; and because time is limited, difficulties of time allocation or *role conflicts* frequently arise. These same time constraints also pose difficulties for the development of new roles and *role sequences*.

The significance of education within this framework is to provide continuing support for learning activity relevant to effective role enactment and to develop "autonomous" capabilities for learning and adaptation, for example, flexibility, creativity, open-mindedness.

We have found the role-analytical framework to be useful in organizing and developing our analyses of selected "role groups." Role groups were chosen so that they would manifest a wide range of issues relevant to the framework. For *role conflict* we chose engineers and physicians; for *role sequences* we chose to examine discontinuous work patterns of women; and for *role loss* we focused on the problems of the elderly.

PROFESSIONAL OBSOLESCENCE

Engineers are the group most often discussed vis-à-vis obsolescence--a fact that may be attributed to the abrupt change in the character of engineering education after Sputnik and the cutback in military R&D during the late 1960s. Progress toward improving the situation of engineers seems to be stalled by a lack of effective planning among engineers, employers, and public decisionmakers. These difficulties, in turn, are no doubt related to the employer-specific character of engineering activity. Hence, although professional societies should be more active, most writers (Dubin, 1971; Renck, 1969; Margulies and Raia, 1967) place the major responsibility on the management of individual enterprises. The fundamental problem that engineers and management have not effectively handled is *the conflict between current and future role performance* that arises in the face of rapid technological change. Specifically, the literature reports that

- Engineers must devote considerable time to updating if they are to avoid obsolescence.
- Organizational climate and especially the behavior and attitudes of immediate supervisors seem most important to induce efforts to maintain professional effectiveness. Yet, many supervisors fail to encourage those below them.
- There seems to be little long-run planning of continuing educational efforts by engineers.
- The various methods of updating--for example, in-house versus off-site courses, conferences, reading journals, sabbaticals--have not been evaluated in terms of their effectiveness.

- Formal courses, in-house or off-site, seem to contribute only marginally to continuing education of R&D scientists and engineers.

On the whole, the role of the formal educational system in assisting persons to maintain effectiveness appears to be very modest indeed. Continuing education courses tend to have a low status within academic environments and are often neglected. Moreover, the estrangement of the academic environment from the typical work environment often reduces the relevance of formal academic instruction. Among engineers, formal courses (in-house or off-site) are seldom sought as a means of avoiding obsolescence; such courses are more commonly perceived as a way of significantly diversifying or upgrading one's job skills. In any case, the effectiveness of these courses has not been evaluated. The more common method of maintaining effectiveness involves *collegial interaction on the job*, and participation in a diversity of job tasks.

In 1969, Social Research, Inc. (Renck, 1969) made a report to the National Science Foundation regarding continuing education in R&D careers. This report indicated the need to evaluate the effectiveness of various forms of educational activity and to examine the organizational climates that affect updating effort. The need for such studies is at least as great today as in 1969.

It is clear from the literature that organizational climate and managerial policy are the keys to effective educational effort. R&D professionals are commonly under such time pressure in short-run projects that a positive inducement toward long-run effectiveness is usually needed. Unfortunately, little research has been conducted in assessing alternative organizational environments as they affect professional workers. And according to Kaufman (1974), one characteristic of most continuing educational programs is an absence of program evaluation and assessment.

The case of physicians is more promising. Because of powerful pressures for updating, continuing education among physicians has been accelerated greatly in recent years. State licensing boards, professional societies, hospitals, and the general public have been instrumental in stimulating this activity. These pressures on physicians are

such that the issue of obsolescence is more likely to be relevant to current professional activity, as opposed to uncertain future contingencies. This fact, together with the more professional (less employer-specific) character of physician activity has facilitated orientation toward continuing education. The following developments are indicative of the situation today:

- Medical societies and the American Medical Association (AMA) maintain an up-to-date roster of courses available for continuing education.
- Some societies have made updating a requirement for membership.
- A Physicians' Recognition Award (PRA) has been instituted by the AMA as a certificate of updating effort.
- Self-assessment scales have been developed by which persons can evaluate their knowledge relative to professional standards.
- A "Bi-Cycle" system has been developed by which quality of care in medical facilities may be assessed, identified, and addressed by educational efforts.

There have been some limited efforts to evaluate updating methods on a local basis, but no general assessment of alternative methods has been attempted. Further, there is a great need to determine the actual scope of the problems of obsolescence among physicians and to identify persons who could benefit most from retraining and updating activity.

Although medical societies have been active in assessing needs and developing educational programs, the social importance of medical care and the problems attendant to its delivery are such that other public agencies should play a role in developing more effective processes of continuing medical education.

PROGRAMS FOR WOMEN

The literature on the factors that affect the labor force activity of women is voluminous. However, there has been considerably less research on the problems of role conflict, role sequencing, retraining activity, and educational needs that women often experience. Moreover,

in spite of the rapid increase in the number of programs that purportedly address the needs of women, there have been no broad-based surveys to ascertain their needs. Hence, it is difficult to assess the adequacy of the emerging system of educational programs for mature women. In particular, we found that

- The broad outlines that characterize the work life of women include career discontinuity, a relatively high incidence of part-time employment, and concentration into "women's occupations"--all of which create difficulties in terms of lifetime productivity and earnings.
- Although women may increasingly adopt less discontinuous work lives in the future, the problems of role conflict and role sequences will remain and perhaps increase.
- The problem of multiple role management has been largely ignored in the literature. Research is needed on the basic dimensions of the problem and the effect of social class and race.
- Research is needed to discover whether or not existing programs actually facilitate reentry into the labor force, the characteristics of successful programs, and the populations of women who can or do benefit from them.

This report deals with the difficulties that women often face in pursuing discontinuous work lives and problematic multiple roles. Past research has focused on the demographics of labor force participation and is seriously deficient in dealing with issues that could facilitate continuous, or discontinuous, work activity among women.

With respect to educational needs, no national assessment has been made. We do not really know the dimensions of the problem. Educational programs tend to be developed on the basis of the interests of the academic initiator, or on the basis of suppositions about needs. Among the various educational institutions, programs differ in attributes in ways that cannot easily be explained by differences in the needs of the target population.

THE ELDERLY

The reduced economic and physical (health) resources available to older persons have serious consequences for adaptation to technological change. Although decreases in cognitive abilities may be attendant with old age, the more common problems are associated with the loss of the social resources that facilitate role enactment.

Educational programs can be useful in preparing people for these losses in social support by suggesting alternative sources of support, and by improving the knowledge base that is complementary with one's resources.

The educational needs of the elderly have long been ignored, but two factors have stimulated a more positive orientation: (1) a general growth of interest in problems of the elderly since the passage of the Older American Act of 1965, and (2) the reduction in college enrollment from among the 18 to 22 age group. However, if older persons are not to be treated as a "target of opportunity" by academic institutions, these institutions need to have a better sense of the needs of the elderly and of the appropriate teaching methodologies.

Most educational institutions have not considered the elderly to be integral to their functioning--a fact that is not independent of this general loss of social roles and status among the elderly. Moreover, experimental programs, even when they appear to be successful, seldom become institutionalized. Hence, a first step toward improving access to education for the elderly is to educate the public and academic personnel on the needs and capabilities of the elderly.

Community schools and junior colleges have structural and other characteristics that are amenable to the adoption and institutionalization of programs for the elderly. However, very little work has been done to identify methods of instruction and subject matter that are suitable for elderly students. Thus far, existing programs for the elderly have not been evaluated; the experiences of older persons and of educational institutions have not been researched and disseminated. Indeed, we do not even have a catalog of existing programs.

CONCLUSION

The picture that emerges from this review is that an examination of the effectiveness of ongoing programs and of the relative merit of alternative educational modalities has not been pursued for any of the role groups. None of the role groups have received the benefit of a detailed needs assessment--an obvious first step toward program improvement.

It is not clear that formal educational institutions *should* be the principal source of updating activity for the role groups considered in this report. In fact, there appears to be a growing reliance on other sources of learning, especially on-the-job learning activities. However, this shift toward learning within the work place has not been preceded by studies that would suggest the relative desirability of work place versus institutional learning.

Problems of role sequence that involve extensive investments into retraining, diversification, and updating are likely to be greatly mollified by access to formal educational activities. However, studies of the extent of the problem and of the alternative responses have not yet become available.

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Chapter 1

INTRODUCTION

THE GENERAL PROBLEM

The purpose of this report is to present and explore the usefulness of an analytical framework for assessing the role of formal education in facilitating adaptation to technological change. Such a framework is necessary if existing knowledge is to be seen in an analytically meaningful context, and if research needs in this area are to be more clearly delineated.

The development of the desired analytical framework is made difficult by the extremely vast dimensions of the question. The enormous *potential* scope of this study is made evident from the more general literature on technological change. There is an emerging consensus (Harvard University Program, 1969) to the effect that modern technology--the application of science to human purposes--is a major underlying factor in the evolution of value systems, social and occupational structures, and interpersonal relations. Moreover, technology bears directly on the nature of occupational tasks and the knowledge required for effective work, leisure, and consumption. Given the ubiquity of technology's effect, the potential role of education in facilitating personal adjustment seems to have no visible boundaries.

Technological change has many consequences to which the educational system, as currently constituted, cannot be addressed. For example, the employment problems of coal miners in remote mining towns, organizational or procedural changes in specific business enterprises, and the like may have their basis in technological change and yet not be readily amenable to treatment by educational institutions. Fortunately, formal educational institutions are not the only sources of education. Indeed, they probably are not even the major source for most persons. Newspapers, television, billboards, family members, and friends all are sources of knowledge relevant to technology.

There are two types of adaptational activities that can be said to be particularly relevant to educational institutions: (1) activities

that induce greater flexibility and creativity in one's intellectual functioning, and (2) activities that *update* one's knowledge of technologically altered subject matter and facilitate avoiding obsolescence.

To the extent that education, at any level, facilitates the learning and creative processes, the individual, so benefited, will be less subject to undesired losses in the degree of knowledge, and education will have increased the ability of that individual to adapt himself to change, independently of subsequent educational intervention. However, very little is known about the methods by which the general adaptability of individuals is promoted.

The problem of updating one's knowledge in a subject relevant to work, or life in general, is the central theme of this report; and our focus shall be on *continuing* education rather than with initial educational preparation. The problem to be addressed involves *obsolescence*, a phenomenon often associated with professional occupations but that clearly can be generalized to the domain of knowledge.

The problems of adaptability, flexibility, and creativity, plus the central problem of obsolescence, represent the major issues that the educational system should consider if it is to facilitate the adaptation of individuals to changing systems of knowledge and information. Because the system of formal education has the dissemination of knowledge as its *raison d'être*, it has, on a priori grounds, a significant potential effect on flexibility and obsolescence. These issues are also relevant to other kinds of institutions, which we shall discuss in what follows in cases where they seem to have an important complementary role.

ROLE GROUPS

The project as proposed by the National Science Foundation (NSF) was to deal with the role of the educational system in facilitating adaptation to technological change. This concern with adaptation, furthermore, was to include *all* relevant aspects of life and consider people as consumers, family members, citizens, workers, and as *people*. Because the adaptation problems of blue-collar workers were already being considered in another study, and because technological unemployment and retraining problems had been considered elsewhere, we would

not deal with those matters. Yet, the variety of roles and difficulties that were deemed relevant to this study were enormous, seemingly intractable and poorly defined. It was not clear how one could examine adaptation of people as people, or how one could consider people in each and every important role.

Because of the broad scope of this project, the adoption of a role-analytic perspective seemed appropriate.* The advantages of this approach are that (1) it considers almost all interactions between persons, within the various social and institutional contexts; and (2) it focuses on the many informal and formal learning mechanisms that are instrumental in preparing persons for assignment to social roles and activities. That is, the role-theoretic model includes all of the roles relevant to this report as well as a comprehensive and balanced perspective of the associated learning modalities. Moreover, it considers the complex of factors that affect the availability of roles, the expectations associated with role-role interaction, and the positive and negative sanctions that are defined relative to expectations.

Within the role-theoretic framework, a person's behavior, including adaptation to change, is defined by the social roles he enacts. Indeed, most social interaction does not involve relationships between persons as persons, but rather between persons insofar as they belong to certain categories in the social structure. The doctor-patient relationship, for example, involves interaction primarily on the basis of two social positions and the role behaviors they entail. For the duration of the interaction, other nonspecific roles (e.g., golfer, friend, husband, and the like) are suppressed or placed into appropriate juxtaposition to the primary roles; concurrently, culturally determined proprietary roles (such as behavioral norms related to age, sex, and social class) condition the playing of primary roles. Not only is individual behavior shaped by social roles, but perhaps even more significantly, individual identity or self-concept is largely derived from

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*Expositions of the role-analytical framework may be found in Deutsch and Krauss (1965), Kahn et al. (1964), Sarbin and Allen (1968), Secord and Backman (1974), and Shaw and Costanzo (1970). What follows is based primarily on Sarbin and Allen and Secord and Backman.

definitions and evaluations of the self made on the basis of role enactments.

The role-analytical framework is a multidisciplinary one, drawing its variables from studies of society and personality, and attempting to unite characteristics of individuals with characteristics of social structures insofar as they interact in influencing behavior in a situation.

Because it was not feasible to study all of the roles that people enact, we decided that the project would be most useful if the roles to be chosen were sufficiently diverse as to make possible a similar examination of *any* role groups for which technology and educational activity are relevant. For this reason, we chose professional workers (engineers and physicians) as manifestations of the worker role, women as the family members (and workers), and the elderly. This strategy has been useful, because the particular role groups chosen could be said to have somewhat different types of difficulty in adapting to changes in technology.*

Paralleling the role groups was a set of role-theoretic concepts adopted early in the project: role conflict, role sequences, and role loss. In this context, the problem facing engineers is obsolescence, a manifestation of a devotion of time to present activity to the detriment of future activity, that is, a *conflict* between present and future role enactments. For women, there are conflicts between family and work roles (in addition to possible problems of obsolescence), and there are difficult *role sequences* from housework to market work. For the elderly, there are role losses that rob persons of financial and social resources and that add to the difficulties in several roles, especially because the elderly frequently suffer decreases in the rate of cognitive processing.

The project, therefore, developed a three-tiered conceptual structure (Table 1.1), based on the relationship between groups of persons,

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*We do not claim that these groups are the most disadvantaged by technological change, but simply that they are useful to illustrate the issues and to demonstrate the application of our analytical framework. It is clear that agreement cannot be reached on the selection of the groups *most deserving* of consideration.

the specific role under consideration, and the role-theoretic dimension of particular relevance to the enactment of each role in the context of technological change. We felt that if this structure could be examined, we would have made a good beginning at showing how one could study the effectiveness of education in adapting people to technological change in *any* educationally relevant role. This set of role groups was believed to have broad generality because of their relationships to the set of role-theoretic dimensions.

Table 1.1

THREE-TIERED CONCEPTUAL STRUCTURE

Group	Role	Dimension
Professionals	Work	Role conflict
Women	Family and work	Role sequences
Elderly	Consumer	Role loss

Engineering has been the most widely discussed profession in terms of obsolescence, and much of the general theoretical literature on professional obsolescence uses this profession as a point of departure. However, the major reason for considering engineering is the existence of a 1969 report to NSF on continuing education for R&D careers (Renck). This report was exploratory, based on a limited number of interviews; yet it is the best available published attempt to evaluate the effectiveness of continuing educational activities to combat professional obsolescence.

Physicians also are considered in terms of the problems of professional obsolescence, and were so chosen because of the perceived social importance of obsolescence in medical careers. Within the role-theoretic perspective, professional obsolescence arises from a conflict between the short-run demands for continuous full-time professional activity and the long-run need to combine work roles with student roles. As such, the problem of medical obsolescence, and professional obsolescence in general, is one of *role conflict*, that is, finding, or taking, the *time* required to maintain lifelong professional competence in the face of rapid change when doing so may reduce one's income in the short run.

And considering the allocation of time to professional revitalization, the extent to which educational institutions are efficient in continuing medical education activities becomes the focus of our assessment.

Women who work in professional occupations face similar problems of allocating time between work, education, and other responsibilities. But because of the special burden that family responsibilities frequently impose on women, one may expect their role conflicts to be of greater magnitude than those of men, other things being equal.

However, women frequently experience difficulties that are *qualitatively* different from those of men; and these problems arise when labor force exit and subsequent reentry not only accelerate the rate at which knowledge is forgotten but also remove women from the locus of continuing on-the-job learning activity. In role-theoretic terms, this issue is one of pursuing a set of *role sequences*, which are made problematical by technological change. The literature suggests that current trends in the demographic composition of occupations and the labor market will lead to the increasing incidence among women of these difficult role sequences.

To some extent the problems of men who wish to change careers are similar to those of women who (one may say) move from homemaker careers to labor force careers. This subject has been considered in depth in a recent Rand study of mid-life redirection (Pascal et al., 1975). However, this study did not focus on an analysis of problems unique to women in pursuing existing educational programs.

Another group that is potentially subject to problems of obsolescence are persons over 65. In this case, however, their problems are often not job-related (because most have retired), but are related to difficulties in managing personal and household economies. Because of frequently declining monetary and biological resources and the associated changes in consumption patterns and life-styles, the effect of technological change often strains the adaptive capability of older individuals. There is considerable evidence that many of the special problems faced by the elderly are not invariably associated with the biological aging process, but rather with the abrupt loss of socially esteemed roles. The departure of children, the death of a spouse,

retirement, and related events pose *role loss* as a fundamental problematic characteristic of the aging process. Most persons in modern society are forced to adapt continually to new products and life-styles. The elderly are by no means unique. It is only that the more common incidence of specific impediments to effective adaptation (e.g., reduced income and health status) among the elderly makes them a group deserving special concern in this text.

Today, the acute consumer problems of the elderly are being shared more generally by the rest of the population, with the emergence of the current wave of price inflation. The declining purchasing power of the average family and the energy crisis have combined to pose difficult choices for many nonelderly persons, which are comparable with those typically faced by the elderly. People are now forced to consider different ways of heating (or cooling) their homes, new ways of getting to work, new forms of protein in their diets, etc. The extent to which persons are able to make optimal choices will affect not only individual well-being, but also the overall balance of resources in the economy.

It is clear that the number of educationally relevant role groups is vast and that this project can examine only a small subset of those groups to which specific attention should be given. However, our selection of groups has been guided by the principle that each group chosen for study should effectively illustrate the consequences of technological change on a fundamental characteristic of the role-analytic structure (role conflict, role sequence, and role loss). We hope that an analysis of these groups will have implications for the analysis of other groups that have similar problems of role enactment.

THE NATURE OF TECHNOLOGICAL CHANGE

Because the goal of this study was to examine the interface of technological change with the educational system, it was necessary to develop a useful conception of technological change: Technology is knowledge that is useful in obtaining desired objectives. This knowledge is not invariably manifested in physical matters; rather, it may relate to the manner in which activities are organized, or to the mode of interpersonal interaction. Hence, technology can be conceived rather broadly; and

knowledge relevant to "products" other than commodities may be properly examined. This conception of technology will be discussed in greater detail in Chap. 3.

Once a definition of technological change in the general context of role enactment processes had been developed, we were able to develop a *formal model* of the adaptation of the role enactment process to technological change. This model provides a method of *measuring* the rate of technological change, as defined for an individual within a specific role. As such, it is probably the first effort to define the rate of technological change in a purely behavioral context. Further, the model provides a logically consistent and (in principle) measurable conception of role conflict in the sense of competitive time allocations (not in the sense of inconsistent role expectations) and poses an important definition of role loss that contrasts with an analogous and somewhat contradictory concept of role loss often found in the literature. Finally, this model relates the enactment process to behavioral objectives--individual well-being.

This model will be employed to characterize the problems of the several role groups covered in this report, and the discussion of these groups will focus on factors suggested by the model: relevant (non-knowledge) resources and knowledge requirements; the implications of knowledge and resource requirements for role enactment, role conflict, role sequences, or role loss; and the nature and extent (if known) of educational programs that address the needs of the various groups.

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Chapter 2

A GENERAL MODEL OF ADAPTATION

INTRODUCTION

A central purpose of this study is the development of a behavioral model of adaptation to technological change. The need for such a model arises from the broad scope of our inquiry: a concern with all forms of individual adaptation to changing social expectations that have their roots in changes in technology. To proceed with such an inquiry, we need a workable definition of technology and technological change; we should have a conception of the factors that are useful in facilitating, or impeding, adaptation; we must delineate the condition in which adaptation is feasible; and, at least formally, we should specify the meaning of *optimal* individual adaptation, given the factors that affect the costs and benefits of the process. If these goals can be accomplished, we will, at least, be able to describe the *problem* to which the educational system is presumed to have some relevance. Moreover, we may also be able to obtain insights into the relative importance of formal educational institutions in the adaptive process.

Of course, it would be desirable to proceed beyond the stage of problem definition and problem assessment, to the examination of alternative solutions. In our studies of specific role groups, we have sought to look for "solutions," to the degree that the data permit. However, if we are to go beyond the level of very broad generalities, the issue of effective educational intervention tends to become role group-specific, making a general model of the *solution* difficult to conceive. Moreover, because of the paucity of programs that address problems of adaptation and the absence of evaluation of the relative effectiveness of the existing programs, it is not possible to define the specific character of intervention strategies that are appropriate to rapid technological change.

In this chapter we shall pose a conception of technology that seems appropriate to this study and proceed to examine the general model of individual adaptation to technological change. This model

will be useful in setting forth a set of relevant variables that can then be examined in the context of specific role groups; it also clarifies and gives unambiguous meaning to the role-theoretic concepts that underly our analysis.

Because this project has a scope that extends well beyond the work (material production) roles of human activity, it is important that we have a definition of material and nonmaterial technology that facilitates discussion of nonmarket and nonmaterial forms of production. Moreover, it is possible that nonmaterial and nonmarket forms are becoming more important, at least in advanced countries, as the struggle to obtain minimal subsistence fades in the wake of relative affluence. Persons in all walks of life are increasingly reducing their preoccupation with such factors as the rate of growth of gross national product toward other welfare considerations (e.g., pollution, congestion, quality of life), so that the types of technological change that we are likely to experience in the future may be increasingly in the nonmaterial, nonmarket context.

Most often, technology is identified by reference to physical implements that are useful in the production of commodities, such as the wheel, the axe, and the sewing machine. In addition, the knowledge that persons need in order to make use of these physical implements, or tools, has been designated as part of society's technology. Hence, technology has been construed by reference to factors that increase the (economic) productive capacity of persons within a given social and physical environment.

However, if we extend the logic, technology must be defined not as the material implement per se, but as the underlying "idea," the knowledge required for constructing the implement. Kenneth Komoski (1970) has argued that it is "human thought--rather than physical matter--[that] is the true material of technology" (p. 5). The most common delineation of knowledge (or thought) regarding technology is in terms of those bodies of knowledge that are useful, directly or indirectly, in producing material culture. Hence, knowledge relevant to organizing production of a machine, to using the machine, and to using the products in a subsequent operation is called technology.

Even if we restrict our consideration of the manifestations of technology that arise in economic production, various forms of non-material technology become relevant. For example, knowledge about effective interpersonal behavior has been of importance to the administration of economic enterprises and, presumably, has consequences in terms of the cost of production. In this way, the "tools" provided by psychology, sociology, economics, and other forms of systematic thought have been important to technological change during this century. But we should not restrict consideration of knowledge to the market framework. Knowledge about interpersonal behavior is also useful in the performance of one's role as a family member, for example, as spouse or parent. Such knowledge plays the role of technology in this context. Indeed, there can be no justification for restricting technologically relevant knowledge to the context of the market economy. We can and should discuss technology and technological change in the context of most forms of human activity (child-rearing, collegial interaction, athletics, and so forth) without resting that discussion exclusively on the availability of relevant material implements.

The rate of technological change in the production of commodities has been mentioned most commonly in terms of the rate of growth of output per person, or as any kind of shift in the production function (see Lave, 1966, for an interesting discussion of various definitions and measures of technological change). These definitions focus on the *consequences* (with respect to output) of changes in technology; they are not a measure of technological change per se. Technological change is the change in the underlying knowledge base that generated the change in output. *Hence, the idea that the rate of change in output per person constitutes a measure of technological change rests on the presumption that it is appropriate to weigh the importance of new technology by the related output change.* This orientation may be appropriate for those concerned with the national output of commodities, but it is inappropriate for this study.

Because we are dealing with problems of human adaptation, it is clearly inappropriate to weigh the significance of new knowledge by its material output consequence. *Rather, we shall define the rate of*

technological change by reference to the amount of time that an individual requires to learn new information relevant to the enactment of specific roles. In this way, we shall weigh the importance of new technology by its adaptational requirements, so that if there is an increase in the rate of technological change by our definition, there is necessarily an increase in the amount of effort required of persons to achieve the necessary adaptive response. The amount of time required may be reduced by efficiencies in knowledge accumulation made possible by educational institutions, mass media, and other sources of knowledge. Hence, the relevance of education to technological change is a very direct one.

Is there a relationship between the conventional commodity-weighted measure and our adaptation-weighted measure of the rate of technological change? The answer depends on one's level of analysis. In specific industries, for example, great increases in productivity may have little effect on workers except, perhaps, to reduce the rate of growth of the work force; that is, productivity increases need not be specifically related to adaptation problems; and the reverse is also true. A new body of knowledge that a person *must* learn to be up-to-date may have little or no immediate consequence in terms of material production. However, it is likely that *an economy* that is characterized by high rates of changes in commodity-weighted rates of technological change also would have high rates of change in *overall* adaptation-weighted rates of change. The lines of causation between these rates are not likely to be determined, however, because no one has yet been able to find a relationship between specific new technologies and output changes. It is for these reasons, then, that the study of the role of education in facilitating adaptation to technological change must be considered on the basis of a conception of technological change that differs from the conventional commodity-weighted conception.

Finally, increases in output are most often evaluated positively, while increases in adaptation time are evaluated negatively. It has been suggested that adaptation processes are among the *costs* of increased productivity. However, the psychological literature on adaptation (e.g., Helson, 1964) does not support a simple negative

characterization of adaptation; rather, it argues that there is some positive rate of adaptive effort that is optimal in terms of the psychological well-being of the individual.

THE MODEL

Before presenting our own model of the processes by which the effectiveness of role enactments is maintained over time, we will describe what other models are available.

Models of adaptation derive from diverse areas of investigation: physiological stress research, perception and information processing research (e.g., Helson, 1964), and clinical and social psychological studies of effects of critical life events (e.g., Parkes, 1971; Tyhurst, 1957). We have reviewed this literature to develop an analytical framework for assessing the role of education in facilitating adaptation to technological change. Within this literature, there exists a line of theoretical development that provides a useful point of departure; it is based on Helson's (1964) "adaptation level" thesis, as modified primarily by Lawton and Nahemow (1973) to include all levels of responses to environmental stimuli (from physiological and perceptual to affective and social). Other important contributions to the model come from the work of Clark and Anderson (1967), Lowenthal and her associates (see especially Lowenthal, 1968, 1971), Lowenthal and Chiriboga (1973), Dohrenwend and Dohrenwend (1969), Korchin (1965), Ruff and Korchin (1967), and Tyhurst (1957).

Although few of the sources we have reviewed actually use the phrase "adaptation level," the majority employ a comparable concept. For example, Howard and Scott (1970), in attempting to devise a generic model of response to social stress, begin with the supposition that "each human has a characteristic level of activity and stimulation at which it [the human] most comfortably functions." Tyhurst (1957) and Parkes (1971), in developing an account of psychosocial transitions, employ an approximately similar concept that includes a frame of reference for interpreting and evaluating environmental events, together with sets of expectations and appropriate response repertoires.

Adaptation level models seek to represent the behavior and affective outcomes of all of the interactions between persons and their

environments. These models suggest that when the environment demands very little of an individual (i.e., expects low levels of role enactment) or allows relatively few roles to be part of the person's role repertoire, those individuals who possess high degrees of competence will suffer negative affect (emotion). Negative affect may also arise when the demands of the repertoire exceed the person's capacity for effective role enactment. Hence, the adaptation level model presumes the importance of a balance between environmental demands on one hand and individual adaptive capacities on the other.

The adaptation model, as it emerges from the literature, has severe limitations. First, the concept of an adaptation level is homeostatic in orientation, placing any certain behavior and affect into one of only several possible categories, depending on the capabilities of the organism relative to the opportunities provided by the environment. As such, it represents a very limited conception of the possible degrees, and forms, of gratification achievable from human action. It hardly is sufficient to restrict concern to questions about the general *level of activity* or the *number* of roles, omitting the *quality* of the enactment of the various roles. Psychological well-being is reduced, perhaps, if a person suffers the boredom of relative inactivity, but any model that omits the affective consequence of *social evaluations* of the quality of one's activity can hardly begin to satisfy the requirements of role-theoretic analysis.

Second, a specific level of activity within a role repertoire can be consistent with a large number of different allocations of time among roles. Hence, affect hardly can be defined by reference to the level of activity alone. Moreover, there is no reason to presume that time allocations that are marginally satisfactory in terms of personal and social valuations of enactment will be marginally satisfactory to the role incumbent. Rather, one may *prefer* to exceed the norm of performance in some roles, even at the cost of being somewhat "inadequate" in others. In other words, a homeostatically oriented adaptation level model cannot examine the *optimization processes* associated with effective and satisfying enactment of role repertoires.

Third, the adaptation model does not distinguish between levels of activity that derive from the multiplicity of roles, as opposed to

the rate of technological change in these roles. Although this is a criticism of little importance to the proponents of the model, it has obvious significance for this study. It is clear that the emphasis of the model is on the issue of *role loss*, a factor that may be indirectly affected by technological change, and not on problems of maintaining desired performance levels within specific roles in the face of changes in the knowledge and resource requirements (i.e., the technology) of these roles.

Finally, the model fails as a *formal* model. The variables on which it is based are not measurable, even in principle. Rather, the model is useful only as a tool for organizing one's thoughts on the issue of adaptation levels, not as a tool that could be the basis of empirical determinations of the relationship between mental stress and resources, on one hand, and outcome variables (adaptation and affect) on the other.

As a result of these shortcomings, the adaptation level model shall not be used in this report. Instead, a new model will be presented. This model will have an optimization orientation rather than homeostasis; it will have knowledge and resources as its basic elements, as is required in our conception of the technology of role enactment, and (with the exception of "well-being") will be defined in terms of variables that are cardinally measurable, at least in principle. This model shall be used to define the rate of technological change, the type of role conflict, and the characteristics of role loss that underly the analysis of the several role groups covered in this report.

The general character of our adaptation model is as follows:

- The level of performance that an individual can achieve in specific roles shall depend on the possession by that individual of physical, psychological, and cognitive assets relevant to role enactment. In the context of technological change, obsolescence in role performance (i.e, time-dependent losses of effectiveness in role enactment) can be avoided only by commensurate increases in resources and knowledge.

- Increases in role-relevant resources and knowledge are costly in terms of the time required to acquire them, so that *the rate of technological change* in role enactment may be defined by reference to the minimum amount of time required to avoid role obsolescence. However, because time is limited, difficulties of time allocation, or *role conflicts*, may arise that make it difficult to perform all of one's current roles and maintain role capability. These same time constraints also pose difficulties in developing new roles and *role sequences*. The happiness, or affect, of an individual is a function of the level of role performance, and the composition of the role repertoire.
- The level of role performance by an individual is assumed to be a function of the role-relevant information that the person possesses and role-relevant resources (e.g., money, health) that are available to him. Given this conception of the basic process, we shall be concerned with the factors that affect the level of performance over time: changes in information and resource requirements, relative to the information processing capability and resource base of the individual.
- The role of the educational system, then, is to facilitate information processing by increasing a person's autonomous adaptability and by providing information relevant to specific roles and role transitions.

Knowledge and Other Role-Relevant Resources

In the social context of the particular enactment process, that is, the relevant social structures and social expectations, the success that an individual experiences in role enactment may be presumed to depend on (1) his personality, intellectual capability, and other stable dimensions; (2) his *knowledge of social expectations and the technology for effecting the relevant activities*; and (3) various material resources (physically embodied technology) at his disposal.

Discussions of the implications of rapid technological change for cognitive functioning frequently cite the need for mental flexibility,

open-mindedness, creativity, and other characteristics that facilitate an individual's autonomous learning and adaptive activity. There is considerable face validity to the notion that creative, flexible minds will be better able to cope with technological and other changes imposed upon persons. Yet, when we seek to find scientific support for this proposition, or when we seek to determine the kinds of educational activities that are useful in developing these qualities, the available literature is surprisingly inadequate.

In spite of the generally unsatisfactory state of the literature on the several aspects of autonomous adaptability, the notion that flexibility and creativity are useful as basic resources will be represented in our model of adaptation. Autonomous adaptability may be augmented through learning; and it refers essentially to an aspect of the *capability* to learn, or, more specifically, to factors that would reduce the length of time that an individual would require to learn specific role-relevant information.

If we know a person's autonomous adaptability and the social contexts and resources (e.g., schools) that are available to assist in the learning process relevant to market or nonmarket roles, we may assume that the rate at which knowledge is accumulated is a function of the amount of time that a person devotes to that enterprise.

For example, let k_i be the *new* technology, or information, which *significant others* believe the individual should learn if he is to *remain* as competent as other people in role i. (We assume that "other people" will learn k_i.) That is, an individual's objective level of role enactment may be unaffected by k_i, but the social evaluation of his performance depends on the objective level relative to the level that is socially expected, with the new technology.

Further, let $K_{i,t}$ denote the collection of useful knowledge that a person possesses at time t for role i. Since $K_{i,t}$ is useful (non-obsolete) knowledge, $K_{i,t+1} \neq K_{i,t} + k_{i,t}$. Rather, $K_{i,t+1} = K_{i,t} + k_{i,t} - O_{i,t}$, where $O_{i,t}$ is "knowledge" that no longer is worth learning, given $k_{i,t}$. Hence, for an individual to be successful in maintaining effectiveness in the enactment of role i, he must possess a level of knowledge in each period that is not less than that which is considered acceptable, say, $K^o_{i,t}$, $K^o_{i,t+1}$.

This argument seems only approximately correct, however, because often it is possible to use resources other than knowledge, to some extent, in effecting improved role enactment. For example, a person who has little time to prepare dinner may (1) learn new recipes that yield satisfying dinners in less time or (2) purchase a microwave oven and continue to use old recipes.* For some persons, it would be *more efficient* to spend extra hours in market work to earn money for purchasing the oven than to spend time finding and studying recipe books.

Let $r_{ji,t}$ be the new type of resource j made available at time t for use in role i (and perhaps other roles as well), and let $R_{ji,t}$ be the collectivity of such resources. Then, define

$$R_{ji,t+1} = R_{ji,t} - L_{ji,t} + r_{ji,t} ,$$

where $L_{ji,t}$ are those resources that the individual decides to relinquish, because of the availability of $r_{ji,t}$.

We now may restate the conditions for effective role enactment: Let the pair $(K^o_{i,t}, R^o_{ji,t})$ be a combination of education and other resources, such that *for a particular individual* (or the average individual), these inputs are sufficient to effect an acceptable level of performance in role i. If P_i denotes performance level in role i, and P^o_i is the minimal level of acceptable performance, then $P^o_i = f(K^o_{i,t}, R^o_{ji,t})$. Moreover, since elements in R can substitute for elements in K (as discussed above), a *set* of values $(K^o_{i,t}, R^o_{ji,t})$ may be defined. This is illustrated by the ("isoquant") curve shown in Fig. 2.1. The curve $P^o_{i,t}$ in Fig. 2.1 indicates all combinations of $K_{i,t}$ and $R_{ji,t}$ that generate $P^o_{i,t}$ for a particular individual.

Figure 2.1 is defined only for a "particular individual" because the resources that a person requires may depend additionally on personality, basic intelligence, and other idiosyncratic features associated with role enactment.

Of more importance to our analysis, however, is the *maintenance* of effectiveness in the face of technological change. In this case,

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*The author does not wish to be held fully accountable for the relative desirability of these proposed alternatives.

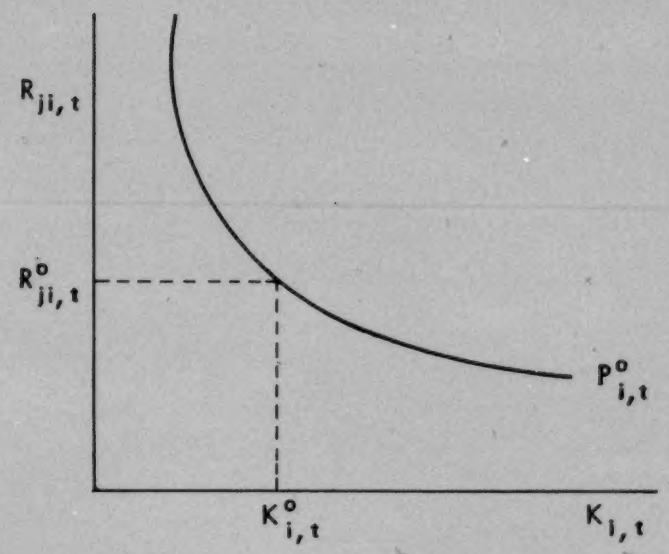

Fig. 2.1 — Values of education and other resources that are consistent with "adequate" role enactment

a person must seek to add to his knowledge the amount $k_{i,t}$ and acquire $r_{ji,t}$ (discarding $0_{i,t}$ and $L_{ji,t}$) so that he possesses some pair $(K^{o}_{i,t+1}, R^{o}_{ji,t+1})$ in the next time period. This will increase his performance from $P^{o}_{i,t}$ to $P^{o}_{i,t+1}$.

Let ρ_i denote the increase in *relative* effectiveness, so that in terms of some evaluation criterion, E_t,

$$\rho_{i,t} = E_t(P^{o}_{i,t+1} - P^{o}_{i,t}) = 0 \ ;$$

then the conditions for maintaining $\rho_{i,t} = 0$ will be that the person accumulate some pair $(k_{i,t}, r_{ji,t})$ such that

$$\rho_{i,t} = g(k_{i,t}, r_{ji,t}; K_{i,t}, R_{ji,t}, 0_{i,t}, L_{ji,t}) = 0 \ .$$

It should be noted that in this formulation $k_i, r_{ji} \geq 0$, but K_i and R_{ji} may increase or decrease, depending on the size of $0_{i,t}$ and

$L_{i,t}$. Moreover, there may be a large set of pairs (k_i, r_{ji}) that satisfies $\rho_i = 0$. Figure 2.2 illustrates the possibilities.

A person whose role maintenance activity does not satisfy $\rho_{i,t} = 0$ is *obsolescent* in the sense that his level of performance in role i is falling relative to the standard by which he is judged. However, he may still be "better" than other people who occupy that role. That is, $P_{i,t+1}$ may exceed $P^o_{i,t+1}$, but the person's continued failure to maintain himself eventually will lead to substandard performance.

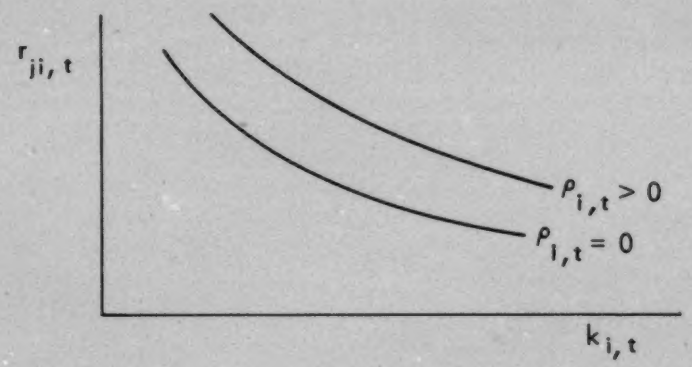

Fig. 2.2 — Relationship between $\rho_{i,t}$ and $k_{i,t}$, $r_{ji,t}$

Measuring the Rate of Technological Change

We have defined technology as knowledge relevant to the enactment of roles. This knowledge may be embodied in material culture, or it may be subject to direct implementation by role incumbents. Moreover, we have found it useful and logically compelling to consider the manifestations of technology in both market and nonmarket contexts.

The most common view of technology, however, has been in terms of its implications for the production of commodities, and the rate of technological change generally is conceived in terms of the consequences of new knowledge for the growth of output per person in the economy. But the concern of this study is with the problem of human adaptation to new knowledge, a problem that cannot be examined efficiently if the consequences of knowledge for adaptation must first be considered in terms of their consequences for the production of commodities.

In the discussion above, we indicated the general relationship between the level of role enactment, P_i, and the relevant inputs, K_i and R_{ji}, given the person's individual *transformation function*--his ability to transform any set of inputs into effective action. We also defined the requirements for maintaining a level of effectiveness and, by implication, the conditions for *increasing* the level of effectiveness.

To go further in this analysis, we must have a common denominator by which resources and knowledge may be measured, a denominator that would play the same role in our theory that money prices play in the conventional theory of technological change. The natural choice of a common denominator in our model is the minimum amount of time that a specific individual (or the average person) requires in order to maintain effectiveness in role i. That is, if there exists a set of pairs (k_i, r_{ji}) such that $\rho_i = 0$, then *the rate of technological change in role i is the amount of time necessary to accumulate the least costly set of new knowledge and new resources consistent with* $\rho_i = 0$. This definition can be given a precise and (in principle) measurable meaning as follows:

Suppose that an individual operating in a specific social context, possessing a certain intelligence and autonomous adaptability, and having access to certain facilitative educational resources is able to learn k_i in a certain amount of time t_i, say,

$$t_i = \psi_i(k_i;\ K,\ R) \ .$$

In this formulation, the individual's capabilities determine the function ψ, and educational resources are elements of R.

The time requirements for r_{ji} can be defined by a similar function, except that we must take into account the salvage value of replaced resources (if any). This salvage value can be translated into the time saved in obtaining new resources, say, t_{si}, so that*

*We shall require that $t_{si} \leq t_{ji}$ and, if the time equivalent of the salvage value of released resources exceeds t_{ji}, this extra time may be employed in the maintenance of other roles. At the moment, however, we are considering only a single role.

$$t_{ji} = \xi_i(r_{ji};\ K,\ R) - t_{si}\ .$$

Hence, k_i and r_{ji} may be translated into functions of time, so that the rate of technological change is the smallest value of $T_i \equiv t_i + t_{ji}$ such that $\rho_i = 0$. We shall call this value T_i^o. See Fig. 2.3. The shape of the function T_i^o in Fig. 2.3 reflects our assumption that time expended on the accumulation of knowledge and resources is subject to diminishing returns. In the cases of constant or increasing returns, T_i^o would be linear or convex to the origin, respectively.

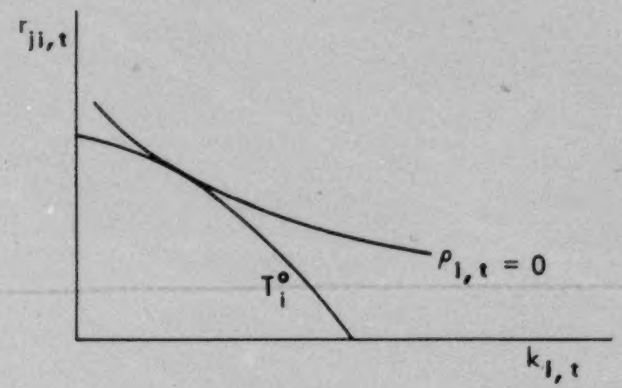

Fig. 2.3 — Defining the rate of technological change in role i

If we wish to measure T_i^o empirically, we would seek to find the average apparent time invested in updating activity among reportedly nonobsolescent persons who enact a specific role.* In such a study, we could note the variety of social contexts, educational facilities, and educational backgrounds and determine their relative consequences

*There can be no designation of T_i^o other than one that arises from the complex interaction of the set of role incumbents, where some persons perform above the norm and others below it. Moreover, some persons may strive to estimate future norms, and prepare to exceed, or match, them by taking appropriate steps.

for maintenance time. Furthermore, if we pursued the effort to measure T_i^o for a large number of roles, we could obtain a rough estimate of the rate of technological change experienced by a specific individual whose role repertoire contains a multiplicity of roles. That is, we would have an estimate of the relevant $\sum_i T_i^o \equiv T^o$, and, coincidentally, an estimate of the reduction in T^o that could be effected by the increased availability of various facilitative mechanisms, such as educational programs.

A major difficulty in empirical estimates of T_i^o, or T^o, is the separation of those behavioral stressors that may be associated with technological change from those that are more indirectly related to technological change, for example, changing labor market and family structures and changing values systems. This is a significant problem if we demand a valid measure of technological change in role enactment; but it is not significant if our attention is on the role of the educational system in facilitating adaptation processes. Very few persons would be willing to accept an educational system that dealt effectively with technological change and ignored changes in social values and social institutions, because the latter often have roots in technological change. Indeed, it would be difficult to provide information and training to facilitate person-environment interaction without first discussing changes in the environment. Hence, although technological change, value change, and social change may be conceived as distinct phenomena, it is clear that educational activity must often address all of these issues in a manner that would frustrate our effort to determine the amount of time devoted to each issue separately.

MULTIPLE ROLES

In the last section we discussed maintenance time and the derived measure of technological change. However, role enactment is not only future-oriented, but it also involves the present.

During any period, say, a "day," an individual must enact the set of roles that constitutes his role repertoire. Hence, in addition to generating a set of maintenance activities, $\{\rho_i\}$, he must make use of existing resources, R, and knowledge, K, to generate $\{P_i\}$.

Suppose that any resource, R_j, may have multiple uses within the repertoire and R_{ji} represents the allocation of R_j to role i. Similarly, K_i may also have many uses. Such multiple relationships between the inputs to enactment processes and the outputs of that process are extremely common in human behavior, because individuals often adopt new roles in terms of the potential usefulness of the resources that they have already accumulated for other purposes. The multiple functions of a specific resource often make it difficult to determine the relationship between the resource and specific role enactment. For example, biological and psychological requisites to human functioning, such as sleep, rest, and food, are always satisfied in the context of specific roles, but may also be viewed as resources for other roles.

Fortunately, a method by which resources may be allocated among uses has been solved by Kuhn and Tucker (1951), whose concern was with determining the product-specific value of resources in multiproduct firms. (For example, if a floor space is used for n products, how much of the value of that space should be allocated to each product?) Kuhn and Tucker showed that an allocation is feasible under the conditions of nonincreasing marginal productivity, a condition that is analogous to our earlier assumption that for any individual, the transformation of time into knowledge and resources was subject to nonincreasing returns.

However, in the discussion below we shall consider only the simpler problem that arises when each resource is role-specific, since there are no conceptual gains to be effected by the technical complexity of "joint production." As a result, the level of any resource, R_j, will be equal to the sum of internal allocations ($\sum_i R_{ji} = R_j$), and the sum of resources used in each role, $\sum_j \sum_i R_{ji}$, will be equal to the total stock of resources R.

Since the environmental context of enactment processes is given, and since the ability of the individual to yield enactments (the personal qualities that affect the transformation of R_{ji} and K_i into P_i) is also presumed to be given *at any point in time*, then P_i should be a function of the amount of time devoted to role i:

$$T_{oi} = h(P_i;\ K_i,\ \{R_{ji}\}) ,$$

where T_{oi} is the "enactment time" associated with role i. As a consequence, the "day" of an individual will be so allocated among the P_i and ρ_i that $\sum_i (T_{oi} + T_i)$ is equal to T, the hours of the "day."*

Role Conflict

There are at least three ways in which roles may come into "conflict." First, an individual's performance of one role may have a negative effect on social evaluations of his performance in another role. For example, a woman who is a mother as well as a professor may discover that her performance as an academic may be partially discounted if her colleagues see her in the presence of her children. Hence, in terms of existing social expectations, there is a failure of role-role congruence and a consequent loss of social approval.

Role conflict may also arise from self-role conflict, where the *self* (as defined by the entire set of a person's social role enactment activity, values, and expectations) finds a discrepancy between its own motivational structure and the social expectations regarding role enactment. Such self-role conflicts are common during periods of rapid social change; and one of the principal dynamics of social change may reside in the willingness of certain individuals to violate established social norms, suffering the attendant social disapprobation.

Role-role and self-role conflicts represent the most frequently mentioned forms of role conflict. However, they are not relevant to our discussion, because changes in values and conflicts among norms are beyond the scope of this project. Such normative conflicts would be relevant only when they arise through ignorance on the part of the role incumbent. For example, if the female professor mentioned above was not aware of the possibility that some colleagues would disparage her because of a "discrepant" maternal role, then she was ignorant of a fact that may have influenced her behavior.

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*The word "day" is in quotes because not all of a person's roles are enacted during the course of 24 hours. Some roles may take most of a day, while others are left for a different day. Therefore, "day" refers to a period sufficiently long for the proper manifestation of the role repertoire.

There is a third form of conflict that is more germane to our concern with technological change: conflicts that arise when there is *not enough time available* to effect "satisfactory" levels of role enactment and nonobsolescent rates of role maintenance, in view of the role repertoire and one's enactment and maintenance capabilities.

More formally, if P_i^o is the socially acceptable level of enactment in role i and requires an enactment time of length T_{oi}, and if technological change in this role is such that $\rho_i = 0$ and requires an investment of T_i^o, then there exists a role conflict if $T^o \equiv \sum_i (T_{oi}^o + T_i^o) > T$, where T is the amount of time in the "day."

It should be noted that this definition of role conflict is independent of a person's desired allocation of time. An individual may not care if he is obsolescent or substandard in certain roles, as long as he is adequate or superior in other roles. In other words, role conflict need not have immediate implications about individual well-being, or affect; nor does the absence of conflict imply nonobsolescence and adequate performance in all roles. Persons have choices in these matters, and these choices reflect the relative rewards associated with the various enactment and maintenance activities. *In our model, role conflict is a phenomenon that is determined entirely by the socially required levels of enactment and maintenance times that are associated with a repertoire, relative to the capabilities of the individual.*

In general, it is not possible to assign the responsibility for such conflict to a specific role; we know only that $T^o > T$. However, people often identify a culprit among their roles as the source of the problem. Such an assignment of blame usually arises when some agency or person demands an enactment time that is inconsistent with the role incumbent's evaluation of the relative importance of various roles. If an individual is not free to determine T_{oi}, or T_i, the role incumbent is forced to accept a lower level of personal well-being.

We can illustrate our concept of role conflict with Fig. 2.4. The individual in question is assumed to possess only one role in his repertoire and his time must be allocated among current enactment and maintenance activities, P_i and ρ_i. The curve labeled T^o indicates

the minimum amount of time that this individual should devote to role i if enactment is to be, and remain, at acceptable levels. If $T < T^o$, it will be possible for $\rho_i \geq 0$ or $P_i \geq P_i^o$, but not both.*

However, if the person's facility in enactment and maintenance is greater than that implied by T, the curve T' may describe the possibilities available. In this case, there is no role conflict, even though an individual may choose to concentrate on preparations for the future, to the detriment of the present levels of enactment, such as indicated by point a in Fig. 2.4.

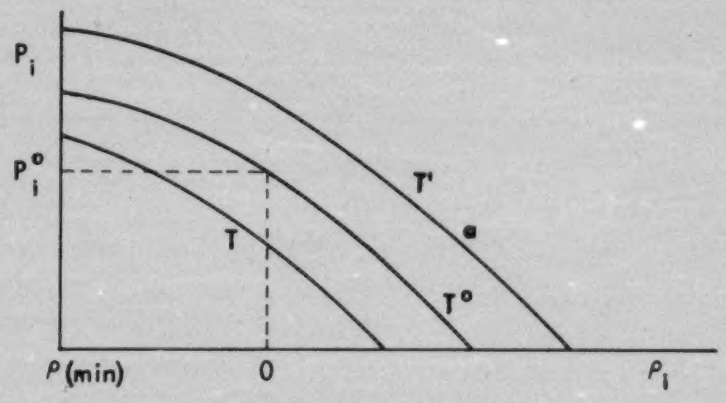

Fig. 2.4—Role conflict: $T^o > T$

Role Sequences

A role sequence is the partial or total displacement of an old role with a new one. Such a sequence has the property of continuity, or discontinuity.

A continuous sequence is one in which the new role emerges incrementally out of the old, in the same way that ice emerges from water, adulthood from youth, or assistant professor from graduate student. These sequences have the property that small quantitative increases in

*On the abscissa in Fig. 2.4, ρ(min) is negative and indicates the extent to which effectiveness falls if k_i and r_{ji} are zero.

effectiveness, $\rho_i > 0$, suddenly have qualitative significance. However, it often happens that such continuous sequences are aborted, with attendant distress; for example, the graduate student loses the role of student but fails to become professor. Such failures are important because a serious role loss often arises, a topic to be discussed later.

The sequence may be *imposed* socially, even though performance capabilities are not adequate to the transition. For example, a youth may have "adulthood" imposed upon him, even though his level of "maturity" is inadequate to the associated responsibilities. Hence, a person who is below standard in initial role performance may become discontinuously lower in role performance subsequent to the transition.

A discontinuous sequence arises when the resource-knowledge base of a new role is largely absent from among existing roles. Hence, large increases in the effectiveness of role performance are required in the new role if adequate performance is to be accomplished.

Our model of effectiveness assumes that increases in effectiveness arise only when *time*, the basic resource, is allocated toward role-relevant knowledge and other resources. Time allocation conflicts can arise if one seeks simply to *maintain* a certain level of effectiveness in each role, but when it becomes necessary to rapidly *increase* the level of performance in one or more roles, time constraints may become painfully binding. Clearly, unless the proper facilities exist for augmenting the rate of learning and resource acquisition required of the new role, undesired losses in the performance of other roles may be necessary.

Of special interest in this project has been the sequence from housework to market work for women with children. It is seldom that market work makes use of a woman's developed skills in homemaking and child care and, hence, the sequence of roles tends to pose problematic discontinuities and resource deficiencies. Moreover, the likelihood of problematic role sequences is increasingly prevalent among men who find that their current occupation no longer can be pursued, because of changes in material technology, market conditions, and personal disabilities.

Sequences across occupational roles may pose two types of adaptational problems: (1) They may require a large investment in new knowledge and other resources, which either displace or supplement current resources; and/or (2) they may involve substantial losses in the *value* of the assets in the individual's role repertoire. In the first case, an onerous investment of time is necessary in educational activity and skills development, and in the latter, there may be an undesired loss in the value of the individual's role portfolio.

To characterize these types of adaptational problems precisely, we must have a method for evaluating the stock of resources and knowledge K_t and R_t that is associated with a repertoire. We shall do so by defining $V_{j,t}$ (the value of $R_{j,t}$) as the amount of time that a person would have to invest to acquire R_j, *in view of today's technology and his current transformation function.* This means that technological change may have the consequence of increasing $V_{j,t}$, or it may decrease $V_{j,t}$ by making resources easier to acquire (e.g., increasing output per person), and thereby reducing the amount of time it would take to acquire them. The value of the stock of knowledge relevant to role i, $V_{i,t}$, may be similarly defined. Hence, the *value* of resources associated with a role is $(V_{i,t} + V_{ji,t})$, and the value of the repertoire is $V_t = \sum_i (V_{i,t} + V_{ji,t})$. With these definitions, we may identify problematic role sequences with circumstances in which large, significant increases in $(V_{i,t} + V_{ji,t})$ are required at a given level of technology, and/or when significant elements of V_t must be displaced.

Role sequences for the elderly are most often decremental in the sense that the value of role portfolios (the V_t) is likely to fall precipitously as work and/or family roles are stripped away. However, the loss of such roles tends to liberate large amounts of time for the performance of other roles of lesser "value"--roles that may (eventually) represent satisfactory substitutes for the central roles of earlier adult life in spite of having a lower (investment time) valuation. Hence, when we refer to role loss among the elderly, we may do so rather unambiguously when the value of the portfolio is considered. But such role losses are not invariably connected with negative affect.

ADAPTATION AND AFFECTIVE RESPONSE

In presenting this model of adaptation, we have implicitly assumed that adaptation is desired by persons and that role incumbents can be expected to make the effort to accumulate knowledge and other resources to maintain a level of performance consistent with social expectations. In fact, the exigencies of role portfolio management do not permit such a simple characterization of the problem.

We have seen that role conflicts may arise that force a person to choose *which* of his roles are to suffer obsolescence and, perhaps, eventual abandonment. Such a forced choice may arise because of a previous decision to exact a *set* of roles that poses excessive performance and adaptive time requirements. Sometimes, persons have a choice regarding the elements in this set of roles and can be said to have constructed a conflict situation for themselves. If so, the "rational" individual will try to ensure that the losses associated with obsolescence in some roles are more than compensated by the performance gains in other roles. Hence, although a person may prefer to avoid obsolescence in all roles, great distress, or negative affect, is not invariably associated with obsolescence in certain roles.

In contrast, role conflicts may arise that pose serious difficulty. For example, the issue of professional obsolescence may present an individual with a conflict between current enactment time and professional maintenance time with respect to a central, critical role within his repertoire. In the absence of some mechanism for reducing the time requirements associated with enactment and/or maintenance, negative affect can be anticipated.

When such inadvertent role conflicts arise, changes in an individual's repertoire become necessary. If he remains "excessively" long in an obsolescent role, he may suffer forcible expulsion from that role; it would be better if he prepared early to adopt a new set of roles consistent with his capabilities. In the latter case, the possibility of adopting a new role set, or repertoire, without a significant loss of human capital requires access to other roles for which the individual's current knowledge and resources are useful. If this is possible, serious negative affect can be avoided when he shifts from one role repertoire to another.

However, effecting sequences of roles is made problematic when it requires large investments of time in knowledge and resource accumulation. Such large investments may be infeasible, or they may be feasible only when many elements of a role portfolio are neglected. Such problematic role sequences include those most readily facilitated by educational instruments; but in the absence of educational and other interventions, the individual is forced to accept a loss in the overall value of his portfolio, with the consequence of negative affect. Negative affect arises not only because of the decrease in the *value* of the role incumbent's portfolio, but because *there was no available alternative to such a loss.*

The incidence of role loss among the elderly gives rise to clear cases of *externally imposed* losses in the values of portfolios and of negative affect. The work and family roles that are often lost to the elderly are replaced only infrequently by other roles of similar (time investment) value. Hence, the avoidance of negative affect requires (1) socialization processes that alter the individual's self-expectations so that a lower valued portfolio is acceptable, and/or (2) external social supports that compensate for the loss of personal assets.

SUMMARY

We have presented a formal analysis of adaptation. This model has identified knowledge and other resources as the factors underlying effective role enactment and role maintenance times as critical restraints on the feasibility of adaptation to changes in technology. The model defines role conflict and role loss in a way that will facilitate the discussion of selected role groups in the following chapters; and the model clarifies the relationship between role loss and negative affect.

Because this model may be the first to define technological change and adaptation to change in a broad behavioral context, it has the potential of becoming the conceptual basis of other work that considers the interrelationship between changes in socially defined expectations of role enactment and the adaptive processes of individuals.

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Chapter 3

PROFESSIONAL OBSOLESCENCE IN ENGINEERING AND MEDICINE

INTRODUCTION

In terms of our model of adaptation, professional obsolescence emerges from conflicts between the time requirements of current role performance and long-term maintenance of the same role.* Problems of long-term maintenance are difficult to solve in a number of professions because specific future job requirements are often not known, and the range of possible requirements is quite extensive; a person is seldom able to devote the necessary time to current responsibilities and maintain *overall* professional competence.

Moreover, nonknowledge resources (R_j) are limited as substitutes for professional knowledge (K_i). The principal resource available tends to be the work place itself, not simply as a source of knowledge but as an environment in which various kinds and levels of knowledge may be used effectively. For example, when an individual lacks technical expertise in an area, the organization may be able to provide colleagues who have the necessary knowledge. Or persons whose technical knowledge is obsolescent may be promoted to managerial positions, if they are fortunate, rather than suffer decreased effectiveness in technical positions. These possibilities for advancement, or for choosing among different types of activities, tend to be more numerous when the activities of the profession are growing rapidly relative to the supply of professional workers, but become quite limited when economic and other factors limit the available options. Unfortunately, there has been little research on the specific manner and extent to which organizations function as supplementary resources in role enactment.

The literature on professional obsolescence most often features the engineer, whose need for continuing educational activity has been

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*Conflicts between different, contemporaneous roles may also have the effect of reducing short-run and/or long-run effectiveness; these conflicts will be discussed in the next section of this chapter.

described as urgent, if not overwhelming, and whose current level of professional competence is not infrequently inadequate relative to current, as well as future, job requirements. This focus on engineering arises from three factors: the growth of new knowledge in the various engineering fields during the last twenty years, the dramatic disjuncture in the form of engineering education that followed the launching of Sputnik in 1957, and the rise of unemployment among engineers in the late 1960s as aerospace employment began to taper off.

The current growth of new knowledge in engineering is such that some observers believe that one-fifth to one-third of an engineer's working time should be devoted to updating activity (Berenson, 1966; Kaufman, 1974). These estimates of necessary maintenance time are not based on carefully controlled observations of professional activity. And, clearly, the amount of time required to arrest obsolescence varies widely among engineers as a function of their area of specialization and the specific character of current and expected future job responsibilities. Yet, the amount of time required on the average seems quite high--so high that one may assume that most professionals are not, in fact, keeping up-to-date (Kaufman, 1974). Roney (1966) reports that at least one engineer out of fifteen suffers obsolescence within his current job assignment and over half suffer general professional obsolescence. The problems of engineers in avoiding obsolescence are particularly aggravated by the apparent fact that many, and perhaps most, engineering-related jobs are rather routine and contain little scientific content.

The launching of Sputnik had the effect of reorienting American engineering education toward a more scientific basis. Mathematics received greater stress and new fields of research specialties arose. This shift in the style and orientation of the engineering profession jeopardized the job security of older engineers, reduced their job mobility, and made them especially vulnerable to fluctuations in the market demand for engineering activity.

A rapidly changing state of the art is also characteristic of the medical profession. According to Cooper (1974), medical knowledge doubles every eight to ten years; and some have argued that current

medical education becomes obsolete within five years after graduation (Breese, 1971). As those for engineers, these estimates of the rate of growth in medical knowledge are not based on sophisticated methodology, and there appear to be no scientific studies on the problem. However, an awareness of knowledge obsolescence permeates the literature on continuing education.

Recent legal decisions have held that a physician is responsible for the level of skill available in his specialty anywhere, not just for the "average skill and care of his community" (Federman, 1970, pp. 237-238). These decisions have provided an impetus to physicians to continue medical education. The threat of coercion contained in public and legislative discussion of mandatory relicensing procedures for physicians has also contributed to the desire of the American Medical Association and state associations to initiate and implement programs of continuing education (Opfel, 1973). Moreover, medical practitioners have had to face the development of new disciplines, such as perinatal medicine, and a marked decrease in the time lag between discovery of a scientific advance and its practical application (Breese, 1971).

In the next sections of this chapter, we shall discuss continuing educational activity in engineering and in medicine, and conclude with a consideration of the differences between these two fields as they relate to the maintenance of professional effectiveness. Although neither field can be said to be typical of professions generally, they permit interesting contrasts with each other.

ENGINEERS: THE ORGANIZATIONAL CONTEXT AS A RESOURCE

There is general agreement that characteristics of the work place are most important to the maintenance of effectiveness in engineering. Work place characteristics are important because they tend to define for the engineer the consequences of allocating productive hours to continuing educational activity as opposed to immediate job requirements. In the absence of encouragement on the part of immediate supervisors, a conflict may develop between the requirements of job responsibilities and the maintenance of effectiveness for potential future roles; this

conflict is too often resolved in favor of an "excessive" preoccupation with short-run goals, to the detriment of continuing educational activity.

Too often the employer is concerned with ways of enhancing the immediate goals of the company, with the individual's needs a secondary interest. The individual, however, may be concerned with his long-range career goals (Dill, 1971; Renck, 1969). These two orientations may coincide in terms of the implications for learning activity, but such coincidences cannot be presumed if the firm has not already made significant educational investments in the worker's productivity. According to Kaufman (1974), jobs in aerospace, R&D, and the federal government are generally better in providing for continuing education than those in the construction, chemical, and petroleum industries and in local government; most other industries seem to actively *discourage* professional maintenance.

Some employers, Kaufman argues, rely on formal educational institutions as a substitute for fulfilling their responsibility for analyzing the educational needs of their staffs and developing more meaningful (firm-specific) approaches to updating. However, 42 percent of the respondents in a sample of 290 scientists and engineers cited on-the-job problem-solving as the primary source of "fruitful learning experience" (Margulies and Raia, 1967), and an additional 20 percent cited on-the-job collegial interaction as primary. *Only 14 percent indicated the primacy of formal courses in-house or off-site. Margulies and Raia concluded that organizational climate is the most important factor in maintaining scientific and engineering competence.* The principal "climate" variables include openness of communication, the responsiveness of organizations to the needs of individuals for development, the individual's ability to seek and find help, the nature of colleague interaction, the extent to which flexible team effort is employed, and the autonomy of individual scientists and engineers in the organization.

In an excellent paper on the subject, Dill (1971) indicates that managers and professionals tend to engage in short-range tasks and are measured by short-range results. As a result, they are

> readily forced into habits of allocating time and energies that run counter to [their] mounting any sustained effort at developing new knowledge and skills. It is other problems of time management on the job, in fact, that have led many industrial training specialists to the conclusion that learning can only take place at times and in places where the learner is totally disengaged from ongoing job pressures. [Dill, p. 52]

Dill's comments were directed toward the problem of motivation toward continuing education, in light of the pressure of other work, the frequent unavailability of effective role models, and the "discomforts of learning" in an environment that contains too much information, as well as inaccurate information. Professionals must want to ask questions and know how to do so, and in the absence of these factors, "organizational changes that reduce barriers to communication have little effect" (p. 55). Hence, professionals need the skills associated with effective basic education and an environment that encourages the use and development of these skills. Dill suggests, however, that such an environment can be problematic for the organization in the short run, because it enables professionals to shift to other employers. "Although defections give ulcers to personnel managers, they can be healthy for the organization and for the man who moves" (p. 56). Such an organization must be "more loosely coupled" than is common among today's organizations. But with a proper organizational environment, persons should be able to pursue self-education through interpersonal interaction, job tasks, and the use of modern educational technologies.

CONTINUING ENGINEERING EDUCATION

The implications of the literature on engineering obsolescence point consistently to the importance of *basic* educational preparation and the work place. However, formal courses in continuing education are of importance. In this regard, we shall review highlights of a report to the National Science Foundation on this issue (Renck, 1969).

The Renck study was based on an analysis of 17 large R&D laboratories and nearby colleges and universities, and involved interviews with 95 R&D executives, 205 scientists and engineers, and 71 persons

at 24 universities and colleges. The sample was not random, but concentrated on laboratories that had some experience in continuing education.

The definition of obsolescence used by Renck and others is compatible with our own in that it stresses the time-dependent process of obsolescence rather than the problem of being obsolete. Their focus on continuing education was broad and included "upgrading" and "diversification" into new professional areas as well as updating activities.*

Programs appropriate to these objectives were fairly uniformly provided by the laboratories reviewed by Renck. These programs included expenses paid to meetings, tuition refund on courses taken off-site, sabbatical leave with pay, off-site short courses, and courses and conferences within the laboratory.

The determination of educational needs was made by a special committee in nine of the laboratories, while six used unsystematic "seat of the pants" methods. However, none of the selected laboratories sought to evaluate the benefits of the continuing education program, nor the relative merits of the various components.

Only 23 percent of the employers indicated satisfaction with the existing structure of continuing educational programs. Needs were expressed in the following areas (percentage):

In-lab courses	17
In-lab lectures	12
Paid educational leave	11
Supervisory	8
Off-site short intensive courses	6
Expenses paid to meetings	5
Tuition refund for noncredit courses	4
Workshops on specific topics	4
On-the-job reading time	4
Improved university programs	4

In-lab courses were considered important because of the direct relevance of such courses to an employee's work and because he could

*Our analytical framework would place upgrading and diversification under the rubric of role sequencing, rather than role maintenance.

discuss the problems in a meaningful way with classmates. These courses were sought as a way of satisfying refresher and updating needs of R&D personnel. University credit courses were considered to be important for basic educational development: diversification and upgrading. But *neither engineers nor university personnel considered the updating process as one for which formal educational institutions could play an important role*. The only important updating role for the universities seems to be in short intensive courses. Such courses could be potentially disruptive if offered on-site, but are useful to those persons whose schedules do not permit less intensive, prolonged, or continuous educational activity.

Renck strongly urged close collaboration between universities and nearby laboratories. It was felt that such collaboration would lead to greater freedom on the part of engineers to devote time to university courses and would increase faculty understanding of laboratory problems. Such collaboration must be mutually beneficial, however, in that the university faculty should benefit by having access to company-owned facilities, which may not be available on campus, and/or consulting relationships with the company.

Renck concludes that continuing education programs will be more effective when there is adequate financing (generally by the employer); when the learning experience is worthwhile; when the courses are consistent with university standards; and when the faculty that teaches such courses has standard academic credentials.

The implications of the Renck study for non-R&D scientists and engineers are not self-evident. On one hand, R&D personnel are more likely than those in industry to require continuous learning activities as a routine requirement of their work; and they are likely to be among the better trained and intellectually more capable persons in their professions. These factors would increase the utility of on-the-job activity as a valuable source of updating activities. On the other hand, the required *rate* of new learning associated within R&D work may be sufficiently high as to impose difficult choices on engineers who must choose between the immediate demands of research activities and their longer run professional maintenance needs. In contrast, many engineers,

and perhaps some scientists, have daily responsibilities that do not require the maintenance of general professional competence. For such persons, the type and extent of learning required for the future may depend on unpredictable changes in industrial production, governmental programs, and the state of the economy. If they are "fortunate," they may continue to perform a set of fairly routine activities until retirement from the labor force; if they are not so fortunate, they may find themselves unemployed and in need of *extensive* updating if they plan to continue to function as engineers. In this case, it is clear that a return to a full-time student role may be necessary before effective labor market reentry is possible.

CONTINUING MEDICAL EDUCATION

As in engineering, the field of medicine has experienced rapid development over the years, much of which arises as a result of technological changes and a concomitant growth in knowledge. Physicians are showing interest in continuing education because of new scientific knowledge and because of other pressures (both external and internal) being experienced by the profession. The general public, many state legislatures, and the U.S. Congress have also expressed interest in the importance of physicians keeping up-to-date and in the subject of physician competence. Various governmental commissions have formally recommended that physicians be required to participate in continuing medical education. One of the most recent such commissions was the Commission on Medical Malpractice ("Policy Statement on Continuing Medical Education," 1973). Perhaps as a result of the convergence of all of these phenomena, physicians' interest and participation in continuing education courses have undergone fairly rapid growth.

Review of Literature

Surveys of physicians' opinions ("Survey of Continuing Medical Education," 1968; Kotre et al., 1971) indicate that most physicians pursue some means of keeping up with new knowledge in their field, and a certain percentage take advantage of special courses or other means of continuing education. Many physicians see lack of time and

the pressures of their practice as the major impediments to their ability to pursue continuing education, while general practitioners and some specialists claim they suffer from a lack of access to appropriate continuing education courses.

The medical literature on continuing education contains references to a number of educational modalities: continuous courses, intermittent courses, circuit courses, home-study courses, radio or television courses, and postgraduate traineeships.

In the opinion of Escovitz (1973), the new trends in medical education include a shift toward greater roles to be played by the community hospital, self-evaluation, and a concern for relating efforts in continuing education to an analysis of the quality of patient care; according to Escovitz, these trends are mutually supportive.

Selzer (1971) places great emphasis on the role that could be played by the community hospital in continuing education. In his view, the hospital in which a physician treats his patients is a logical place for the physician to be exposed to continuing education, since staff members can then relate new advances directly to their own patients. He argues that any hospital can develop accredited teaching programs if its staff is properly motivated. (The greater use of community hospitals in continuing education was urged in "An Innovation in Continuing Education" (1972), which described a program that is operational in 19 hospitals.)

One of the impediments to the development of continuing education programs has been the lack of acceptable accreditation procedures for the growing number of such programs. Moreover, according to Ruhe (1968), the process of accreditation itself could be useful in encouraging institutions to assess and improve their programs.

As of December 1974, a number of state medical associations had managed to implement some form of the accreditation process. Forty state medical associations had been approved by the Council on Medical Education of the AMA for accreditation of organizations or institutions sponsoring intrastate medical education programs (Mangun, 1974). As indicated in Table 3.1, there has been a rapid growth in the number of continuing medical education courses in an increasing number of institutions.

Table 3.1

CONTINUING MEDICAL EDUCATION COURSES,
1961-1962 TO 1974-1975

Year	Total Courses Reported	No. of Primary Sponsors	Location of Courses			
			Medical Schools		Hospitals	
			No.	%	No.	%
1961-1962	1105	206	--	--	--	--
1962-1963	1146	208	626	55	104	9
1963-1964	1246[a]	267[a]	760	60[a]	163	13
1964-1965	1569	251	857	55	265	16
1965-1966	1641	252	863	53	351	21
1966-1967	1608	262	910	57	338	21
1967-1968	1830	263	1000	54	224	12
1968-1969	1922	300	1024	53	370	19
1969-1970	2016	323	886	44	441	22
1970-1971	2319	303	813	35	374	16
1971-1972	2354	392	895	38	601	26
1972-1973[b]	2082	253	957	46	343	16
1973-1974[b]	2441	287	1061	43	426	18
1974-1975[b]	3677	393	1516	41	652	18

SOURCE: A. Crowley (ed.), "Continuing Medical Education: Medical Education in the United States, 1973-1974," Sec. IV, *Journal of the American Medical Association*, Vol. 231, 1975, p. 66.

[a]Includes courses offered by five Canadian schools not reported in other years.

[b]Includes only courses offered by accredited institutions and organizations.

In January 1970, continuing education became mandatory for membership in the Oregon Medical Association. Under the plan, specialty organizations prepare lists of acceptable study opportunities for physicians, and physicians submit a report of their activities in continuing education to the specialty society (Pennington, 1970). Pennington noted that under this program the quality of state and local educational programs would improve and that inadequacies would be identified. Critics of the Oregon plan argued initially that the Medical Association would lose a significant number of members, and that the plan would thereby

fail to achieve its objective. However, the membership has reacted positively to the plan. Since 1970, a number of other states have followed suit. As of December 1974, twelve state medical associations had made policy decisions that may have the effect of requiring continuing medical education as a condition for membership (Mangun, 1974).

The American Academy of Family Physicians was the first specialty society to require a specific kind and amount of continuing education as a condition for membership. By 1974, however, three other societies had adopted a continuing medical education requirement for membership (Mangun). The additional societies now having this requirement are the American College of Radiology, the American Psychiatric Association, and the American College of Emergency Physicians.

State boards of medical examiners also have the potential of placing pressure for continuing education. Thus far, four state boards have authorizing legislation that enables them to require the physician to furnish evidence of his participation in continuing medical education as a prerequisite to reregistering for a license to practice medicine. These states are Kansas, Kentucky, Maryland, and New Mexico (Crowley et al., 1973-74).

Outlook for the Future

The medical profession will probably continue the development of continuing education programs, because of the growth of more scientific knowledge, public and governmental concern about the issue of physician competence, and the pressures of malpractice suits.

Although the medical profession thus provides a very good example of a field experiencing severe stress from technological change and one that is attempting to respond to this stress in many ways, it appears that the quality of, and access to, continuing medical education will keep developing in the future. As many studies noted, the quality of care will probably remain the central issue in the development of such programs.

Interest in retraining programs and creation of part-time opportunities may depend on the profession's perceived manpower needs. With projected shortages of physicians, the possibility of retraining otherwise inactive physicians may be attractive, especially if this can be

accomplished at relatively low cost. In the past, many physicians may have been able to drop out of the profession for some time and return to practice without retraining, if they wished, since there are few legal barriers to reentry. If recertification and relicensing pressures continue to accelerate, however, they soon may no longer be able to do so.

Perhaps because of the many pressures that have been placed on the medical profession, a fairly wide range of continuing education options has been developed. Of special importance has been the role played by the American Medical Association, state medical associations, and medical specialty societies in interacting with educational institutions to develop these continuing medical education programs. The range of options in continuing medical education includes formalized courses that meet on a continuous or intermittent basis, courses that involve use of more communications media, post-graduate traineeships, attendance at professional meetings, and the wide variety of medical journals.

Two particularly interesting innovations have been the development of self-assessment tests and the Physicians' Recognition Award (PRA) recently initiated by the AMA to signify an individual's engagement in continuing educational activity. Self-assessment tests are used to help physicians determine their areas of strength and weakness and plan a program of continuing education suitable to their needs. The PRA acts on an optional form of physician recertification and has the advantages of stimulating interest in continuing medical education, as well as informing the public of the physicians' educational activities.

Both the self-assessment tests and the PRA will need further development in the medical profession; other professions might do well to scrutinize these developments, as it appears that the concepts involved might be widely applicable.

THE ORGANIZATIONAL CONTEXT OF MEDICAL PRACTICE

If we recognize the importance of organizational climate to professional maintenance among engineers, we may presume a comparable relationship between the organization of medical practice and the degree

of obsolescence. However, the medical literature that we have surveyed carefully avoids explicit indication that solo physicians are more subject to obsolescence than others, or that some specialists are less obsolete than others, and so forth. Yet, there are clear implications that general practitioners are less likely to find useful course offerings in medical schools, because medical research is highly specialized; and we question the importance of hospital affiliation as a source of continuous learning in light of the growth of updating methods that are hospital-based.

Because many physicians do not have the benefits of an effective organizational context for continuous learning, the development of self-assessment techniques is important, especially for general practitioners (GPs). The latter are the initial contact that patients make with the system, and hence patients are less likely to be guided in their choice of GPs through referral by other physicians. Moreover, patients are seldom capable of directly assessing the medical knowledge and diagnostic capability of the practitioner. Indeed, many other factors may emerge as more important in the patient's evaluation, such as the location and decor of the office or the performance of office staff. Hence, it is not clear that a solo general practitioner is subject to sufficient incentives to maintain high levels of professional competence, even when self-assessment scales are available as a monitor of competence.

Periodic recertification has been discussed as one means of ensuring that a physician continues his medical education. Hickam (1970) discussed the concept of recertification, exploring the possibility of requiring certification by examination or giving credit for attendance at educational and scientific meetings. One of his main concerns was the establishment of a feasible recertification system. Recently, the American Board of Family Practice adopted a recertification requirement, and 22 other medical specialty boards now advocate recertification and are in the process of establishing procedures and requirements (Mangun, 1974).

It is clear that imposing recertification requirements *with high standards for passage* cannot be developed quickly without considerable opposition from physicians. However, such requirements could and,

perhaps, should be developed along with the development of updating mechanisms accessible to physicians in all geographic locations, organizational contexts, and medical specialties.

SUMMARY

We have noted the considerable effort among physicians toward continuing education, certification, and mandatory updating activity. This effort has benefited from the power and resources of medical associations, but the underlying motive force has been the rising public and private demand for high-quality medical care.

When engineers become obsolete, they may be given new positions that are consistent with their abilities, or told to go elsewhere. Physicians, however, may continue to practice their profession, even in the face of considerable obsolescence. The cost of this obsolescence cannot be measured by unemployment rates among physicians, but by the unwarranted deaths, illness, disabilities, and social losses associated with substandard medical care. In recent years, these private and social costs have been reflected in the growing incidence of malpractice suits, which have led insurance companies to raise malpractice insurance rates to physicians. These higher insurance costs are largely passed on to patients. Hence, the effect of medical obsolescence is not restricted to isolated physicians; and it has been in the self-interest of physicians in general to avoid the development of obsolescence in their field.

Although it is clear that formal educational institutions are significant in the development of new techniques in medicine and engineering, the importance of such institutions as providers of continuing education for practicing professionals appears to be relatively modest. For physicians, there is a growing emphasis on the use of community hospitals and learning centers; and among engineers, on-the-job experiences are cited as the primary source of new knowledge.

The relative unimportance of formal educational institutions as providers of continuing education for professionals may be inherent in the structure of the problem. Yet, we cannot be certain that educational institutions are not simply failing to provide their proper,

socially optional share of continuing educational activity. Certainly, the common academic emphasis on front-line research militates against continuing education as a high-priority activity. For these reasons, we cannot easily assess the performance of these institutions relative to their potential. Considerable additional research will be required.

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Chapter 4

TECHNOLOGICAL CHANGE AND ROLE SEQUENCES: SPECIAL PROBLEMS OF WOMEN

INTRODUCTION

The effect of technological change on the enactment of the work role is, to a certain extent, the same for women workers as it is for men. Automation, for example, has eliminated some of the least-skilled jobs performed by both women and men. The rapid pace of technological change renders both women and men workers, depending on their occupations, prone to knowledge obsolescence. The threat of obsolescence makes it essential that vulnerable workers, regardless of gender, allocate time to the use of educational resources.

However, the effect of technological change on women workers is unique in two important ways: (1) as wives and/or mothers, they generally bear primary responsibility for home maintenance and child-rearing, and (2) because of difficulties in meeting the demands of their multiple roles, they move in and out of the labor force far more extensively than do men. Consequently, their work lives are characterized by discontinuity, and the maintenance of effective work role performance is considerably more problematic for women than it is for men. They are more prone to obsolescence in the sense that they are more likely to "lose" skills and information during periods in which they are not working. And it is more difficult for women in general to make effective use of educational resources, either on the job or for the more extensive updating needed to reenter the labor market, since the demands of their domestic roles compete for major portions of their scarce time and energy.

In this chapter we review the literature concerning the labor force participation of women, focusing on their special problems of career discontinuity and the management of multiple roles. We attempt to assess the role of technological change in exacerbating or alleviating problems in the maintenance of effective role performances and to characterize the current state of educational and other resources for managing role strain.

At the outset, it is apparent that there is a tremendous need for research in this area. Perhaps the most striking discovery of our literature search was how little is known, beyond the level of assumption or anecdote, of the problems and needs of women who work or wish to work. We have no idea, for example, how many women are affected by obsolescence or how many women would work if barriers to their employment were removed.

The empirical evidence that does exist is based on analyses of cross-sectional data, and does not adequately reveal the factors influencing *actual* decisions of women regarding employment. The only longitudinal data we are aware of was gathered for the Manpower Administration by Herbert Parnes and the Ohio State University Center for Human Resources Research (Shea et al., 1970; Kim et al., 1973). However, the data are not very useful for our purposes, because of the importance of recent changes in the work-life patterns of women, because working women constituted only one of the populations of interest in that investigation, and because many questions of relevance to this report were not posed. Clearly, the effective formulation of educational policies regarding women workers will have to await the results of more intensive empirical investigation.

Our concern with the effect of technology on women workers is focused on two adaptation problems suggested by the role-theoretic framework: (1) the problem of managing the *transition* from the homemaker role to an occupational role, or the problem of reentry; and (2) the problem of managing the *role conflict* between family and occupational roles. This latter problem is likely to affect the majority of women workers at one time or another, whereas the problem of role transition pertains primarily to women whose careers are discontinuous.

In terms of the adaptation model, the effect of technology on the first problem, role transition, is to exacerbate the problems of obsolescence associated with technological change by increasing the magnitude of new learning required by work force discontinuity, and, simultaneously, technology is a source of increased resources available to help alleviate the stress caused by role conflict.

ROLE TRANSITION: JOB REENTRY

Reentry into the occupational world after a period of exclusive devotion to homemaking and child care is a special, rather dramatic instance of the problem of transition between discontinuous roles. Dougharty (1975) has aptly summarized the conditions for the successful reentry of housewives into the labor market: (1) They must have retained a certain level of capability in an occupation (either the role requirements do not change and their skills have not deteriorated, or they must have kept up with changes in the occupation); (2) they are able to find jobs requiring skills that may be learned quickly; or (3) they are able to find a job at a skill level lower than that required for their previous jobs.

Unfortunately, the literature on women workers offers very little evidence regarding the reentry process. Much of what is written consists of impressionistic evidence and unsupported assumptions. There has as yet been no large-scale investigation of the scope and dimensions of the reentry problem. No attempt has been made to assess the needs of women who fall into this category (Dougharty; conversation with Helen Astin, February 1975).

If there is little empirical evidence regarding the reentry process, even less is known about the effects of technology on reentry. Few studies of the effect of technological change on employment have focused on specific effects on the employment of women (Wells, 1970).

Discussions of the effect on technological change on employment generally deal with rather broad consequences, perhaps because the meaning of technological change itself is so difficult to specify. Its effect rarely is direct; rather, it depends on the response of the social structure, particularly the occupational structure, into which it is introduced (Harvard Program on Technology and Society, 1969).

The Harvard program has identified two major foci of the effect of technological change on the world of work that are of relevance to the reentering woman: (1) the changing occupational structure, and (2) the importance and rapid obsolescence of knowledge.

Changing Occupational Structure

The Harvard program reports "no disagreement" on the long-term effects of technology on the demand for certain occupations: a gradual elimination of the least skilled occupations and growth in professional/technical and white collar occupations. The Women's Bureau of the Department of Labor (1973) predicts that the highest growth rate between 1970 and 1980 will be experienced in professional and technical fields (39 percent), craftsmen and foremen (20 percent), managers and administrators (15 percent), and operatives (11 percent). There already is a reduced demand for unskilled and/or physical labor, some semiskilled jobs in sales and service, some clerical jobs such as bookkeeping and payroll clerk, and entry-level jobs in banking and insurance (Wells, 1970).

There appears to be wide agreement that women who wish to enter or reenter the labor market should aim for professional and technical careers, currently dominated by men, and make the proper choice of basic education or *upgrade* their education accordingly (Bureau of Labor Statistics, 1970; Seear, 1971; Department of Labor, 1973; Wood, 1974). Wood (p. 305) considers this

> the only alternative to the increased crowding of women into relatively low-skilled, low-paid occupations and a further rise in the unemployment rate for women workers, which is already above that for men.

Obsolescence

The report of the Harvard program finds the growth in manpower demand for professional and technical workers indicative of the key role of knowledge in a highly technological society. Older mobility paths, based on service and experience, have become less viable, Harvard contends; education and technical expertise have become more important.

However, knowledge, once acquired, does not necessarily retain its market value. In an era of rapid technological change, knowledge and skills may rapidly become obsolete. Obsolescence affects all occupational strata, but it is particularly critical for professionals,

> whose expertise is no longer secure once acquired. If they are to retain their status, they must assimilate the new knowledge which is constantly being generated. [Harvard Program on Technology and Society, 1969, p. 7]

The obsolescence problem has obvious implications for women re-entering the labor force. The discontinuous career pattern not only accelerates the rate at which knowledge and skills are lost, but it removes women from the locus of continuing on-the-job learning activity. The seriousness of the problem is illustrated by the situation of women chemists:

> Women chemists, who often leave employment for extended periods of time to rear a family or for other obligations, are in an especially vulnerable position for losing professional competence. As many of them re-enter the labor force, they find their skills rusty and their theoretical knowledge less than satisfactory--if, in fact, they are able to obtain jobs in the field of chemistry at all. This is a great loss not only to the women but to the profession itself. [Rogers, 1970, p. 1]

The societal loss due to underutilization of woman professionals may be of even greater significance than that incumbent on obsolescence of less skilled workers. Although the number of women professionals is relatively small, their knowledge and skill losses, and consequently the amount of time needed to regain these skills, are potentially much greater.

Unfortunately, the limited literature that considers the effect of technological change on women's employment and the literature on reentry give much less attention to the problem of obsolescence than to the problem of the changing distribution of demand (e.g., see Guilbert, 1970; Wells, 1970; Seear, 1971). Obsolescence is assumed to be a natural consequence of the two-phase career pattern (Kreps, 1971), but there has not yet been any attempt to investigate empirically the scope and dimensions of the problem as it affects women workers in general.

However, the literature does suggest that few women anticipate obsolescence and plan ahead for reentry (Rosenfeld and Perrela, 1965; Kreps, 1971; Seear, 1971). Because the first part of the two-phase career is often short and reentry is uncertain,

> the split career thus effectively dampens interest in job preparation in youth when it could be acquired, and makes it more essential in middle age when educational resources are limited. [Kreps, 1971, p. viii]

Many women, then, find themselves at mid-life seeking reentry into the labor market but lacking job-hunting skills and information about the labor market (Seear, 1971; Moser, 1974); information about where to go for assistance (Seear); self-confidence due to lack of recent experience in the occupational world (Seear); and geographic mobility (Niemi, 1974).

MULTIPLE ROLES AND ROLE CONFLICT

The literature on the management of multiple roles suffers from the same deficiencies as the rest of the literature on women workers. Not only is there too little of it, but what there is often is superficial or too limited in scope. The sociological research on role conflict primarily consists of studies that emphasize personal adjustments in role demands and the sequencing of peak role involvements as methods of freeing time for work or study. The economic research on time budgeting, however, gives greater attention to the role of household labor-saving devices in easing the demands associated with housekeeping.

The sociological research on role conflict among working women is quite limited, although provocative, and consists mainly of relatively recent case studies of "two-career" families--families in which both husband and wife pursue full-time professional careers (Rapaport and Rapaport, 1971; Holmstrom, 1972; Poloma, 1972).

The difficulties in maintaining the two-career family, according to Holmstrom, stem from two primary sources: (1) the rigidity of the occupational world that calls for a "careerist life-style" of single-minded, uninterrupted involvement in one's occupation; and (2) the isolation of the nuclear family, in which the husband and wife are the only adults who may be relied on for child care. These factors combine to create role conflict for both husband and wife, a conflict that is experienced most keenly by the wife, because she most often carries primary responsibility for managing housekeeping and child-rearing tasks.

Rapaport and Rapaport (1972) have characterized the major dimensions of the stress generated by such a situation. The first two dimensions are basically psychological and are associated with conflicts of the value orientation of various roles:

1. Discrepancies between personal and societal norms.
2. Dilemmas of identity that result from violation of societal norms.

The remaining three dimensions have to do with conflicts associated with the allocation of time (i.e., "role conflict" in the sense of our model of adaptation):

3. Overload dilemmas, created by excessive role demands.
4. Social network dilemmas, or strains in maintaining friend and kin relationships that result from overloads in work and family role systems.
5. Role-cycling dilemmas, or general problems in meshing peak involvements in family, career, and social network role systems.

In the absence of alternative modes of occupational involvement and family life, these stresses generally are resolved through a complex process of *role bargaining* (adjustment of role expectations) and *role cycling*, which exhibits certain regularities. In each of the studies cited above, the typical solution involved compromises (the husband's career usually took priority over the wife's, and the wife's family roles took priority over her work roles), role-sequencing (so that peaks in family and career involvement on the part of the wife did not occur simultaneously) through discontinuous or part-time employment, and the use of outside help with housekeeping and child-rearing.

Because women in higher status occupations enjoy greater earnings and, hence, have more resources that may act as effective substitutes for their own time in family activity, it is possible that they are

able to effect efficiencies in family responsibilities that more than compensate for the greater time devoted to work activity.

It may be concluded, then, that the extent of actual role conflict among women depends largely on the social and other resources available to them for facilitating continued effectiveness of family and work roles. Unfortunately, little research has been done on the nature, extent, and usefulness of such facilitative mechanisms.

Sweet (1973) raises what he considers unanswered questions regarding women's employment and time allocation:

1. To what extent do other family members spend additional time on these household tasks?
2. To what extent are tasks performed by purchasing services in the market?
3. To what extent does the difference in time allocation between employed and nonemployed mothers indicate that women who join the labor force are either more efficient at household tasks or have lower standards?

The literature suggests that the most important resources in the occupational realm for reducing the stress of role conflict would be the possibility of flexible work schedules (Hedges, 1972; Holmstrom, 1972). Many mothers are employed part-time in order to devote more time to their families, but it appears that the demand for part-time work far exceeds the supply (Seear, 1971; Greenwald, 1973; McClelland, 1973). As with the need for child care, the consensus is that many more women would enter the labor market if more and better part-time work were available.

Technology clearly has made feasible a reduction in time devoted to household tasks, although at the present time there is debate regarding the significance of the effect of labor-saving household devices. Time-budget comparisons between Europe (in this case, Yugoslavia) and the United States indicate substantial differences in time devoted to household tasks--3 more hours per day in Yugoslavia than in a representative U.S. city. This differential is accounted for by fairly large-scale

variation between the two countries in the social role of women and technologically based conveniences such as indoor bathrooms, centralized and efficient shopping facilities, and refrigerators, freezers, and other household equipment (Skorzynski, 1972).

However, although technology may account for gross differences in the demands of homemaking between developed and less developed countries, there is skepticism regarding the amount of variation in labor force participation that household time-saving devices currently account for within the United States (Morgan, 1966; Guilbert, 1970; Oppenheimer, 1970).

Oppenheimer concedes that the increase in the availability and quality of labor-saving goods and services probably has facilitated the employment of women, but has not been a sufficient condition for it, since so many women do not work. In any case, most of the major time-savers--such as refrigerators, supermarkets, convenience foods, gas and electric ovens, vacuum cleaners, and washing machines or laundromats--have been available on a widespread basis to most women for quite some time.

If mechanization of household work were in fact a major stimulant to employment, one would have to show that decreases in the burden of housework were more substantial from 1940 to the present than from 1900 to 1940. Oppenheimer argues in some detail that improvements made in the first part of the century were far more dramatic than in the latter part.

Oppenheimer's contention is that the mechanization of housework does not inevitably lead to decreased amounts of time spent on care of the home and family. It is quite possible, in fact, that technology has led to an increase in housekeeping standards, and, coupled with suburbanization, home ownership, and a decline in the use of household workers, there could be an increase in time spent on homemaking activities. Such a possibility is increased to the extent to which women can find no desirable alternative to housework.

The literature perhaps underestimates the incremental effects of relatively innocuous time-savers, such as pressure cookers, oven timing devices, and convenience foods. Technological improvements of all

magnitudes have no doubt made possible a freeing of time from housework that women can choose, if they wish, to devote to work or to learning or to leisure. The choice to devote this time to work or to learning depends on a variety of other variables, which have already been discussed.

EDUCATIONAL PROGRAMS FOR WOMEN

This section will consider the demand for education among women, the major barriers to their use of the educational system, and the sociodemographic characteristics of those women most likely to enroll in educational programs.

The literature in this area has a number of deficiencies: Much of it is anecdotal or based on small local samples, and few comprehensive evaluations exist that attempt to use data based on random, nationally representative samples. Little is known about women's career development, and models for adequately formulating and developing career goals do not appear to exist. Only recently have data about the level of enrollment by mature women been collected; and data on the characteristics of these women only now are beginning to be collected. Moreover, *there appear to be no current efforts to assess critically the effectiveness of the educational system in helping women reach their labor market objectives.*

There clearly is a need for further research in this area. For example, data about women's experiences with admissions processes and financial aid policies are scarce. The incidence of women in continuing education programs and their attrition-completion rates are unknown. A definitive analysis of all educational programs and courses of study for women remains to be done. Finally, an evaluation of the net effect of continuing education programs is long overdue.

Barriers to the Effective Use of Education by Women

The number of women enrolled in institutions of higher learning has grown steadily over the years (see Table 4.1). However, data have also demonstrated higher attrition rates in the enrollment of women students (London, 1966; Lopate, 1968; Cless, 1969; Harris, 1970; Cohen, 1971). Women tend to drop out *not* during a course of study but after

Table 4.1

ENROLLMENT OF WOMEN IN EDUCATION

Year	Total, Aged 25 to 34	Total, Aged 35 and Over
1950	47,000[a]	NA[b]
1960	371,000[c]	NA
1970	480,000[d]	NA
1972	627,000[e]	418,000[e]
1973	669,000[f]	416,000[f]
1974	869,000[g]	548,000[g]

[a]U.S. Department of Labor, Women's Bureau, *Continuing Education for Women: Current Developments*, U.S. Government Printing Office, Washington, D.C., 1974, p. 2.

[b]NA = not available.

[c]U.S. Bureau of the Census, *Current Population Reports*, Series P-20, No. 110, "School Enrollment and Education of Young Adults and Their Fathers: October 1960," U.S. Government Printing Office, Washington, D.C., 1961.

[d]U.S. Bureau of the Census, *Current Population Reports*, Series P-20, No. 222, "School Enrollment: October 1970," U.S. Government Printing Office, Washington, D.C., 1971.

[e]U.S. Bureau of the Census, *Current Population Reports*, Series P-20, No. 260, "Social and Economic Characteristics of Students: 1972," U.S. Government Printing Office, Washington, D.C., 1974.

[f]U.S. Bureau of the Census, *Current Population Reports*, Series P-20, No. 272, "Social and Economic Characteristics of Students: October 1973," U.S. Government Printing Office, Washington, D.C., 1974.

[g]U.S. Bureau of the Census, *Current Population Reports*, Series P-20, No. 278, "School Enrollments, Social and Economic Characteristics of Students: October 1974 (Advance Report)," U.S. Government Printing Office, Washington, D.C., 1975.

completing one stage, such as after finishing high school or college (Harris). The literature on education and continuing education for women has attempted to explain the attrition of women students by identifying a number of related barriers in the educational system.

One of the foremost barriers to women's use of the educational system has been the discrimination that they have encountered in gaining admission to undergraduate and graduate schools. In a recent review, the Carnegie Commission on Higher Education (1973) concludes that discrimination against women is much less widespread now than it was in the past, but it still exists. Discrimination in admissions can also affect older students (Cless, 1969; Waters, 1971), and may have a harsher effect on returning women students.

Requirements that students pursue a course of full-time study can deter women students with family responsibilities from pursuing an education (London, 1966; Cohen, 1971; Oltman, 1972; Robey, 1972; the Carnegie Commission on Higher Education, 1973; Myers, 1974). More flexible scheduling of classes has been advanced as a means of solving accessibility problems (London, 1966; Clarenbach, 1970; Oltman, 1972; Myers, 1974). The possibility of part-time status can be very useful for women students, because of the expectation that the years between 18 and 25 will be devoted to uninterrupted study and career choice conflicts with social norms and pressure for early marriage and childbearing (Lopate, 1968; Cless, 1969).

However, students who wish to attend school part-time may encounter special difficulties, because almost all federal scholarship and loan aid and many university scholarships are limited to students engaged in full-time study (Robey, 1972; Mulligan, 1973; Brandenburg, 1974). This barrier may be removed if financial aid is made more available to part-time students (London, 1966; Oltman, 1972; Mulligan, 1973).

A related obstacle for women students is the general unavailability of child-care facilities. If child-care centers were established, more women would be able to seek an education (London, 1966; Clarenbach, 1970; Meridith, 1971; Oltman, 1972; Robey, 1972; the Carnegie Commission on Higher Education, 1973; Mulligan, 1973; Brandenburg, 1974).

In summary, there are basic structural barriers that have reduced the participation of older women in educational activities. Some of

these barriers appear to affect both young and old women, while a number of the identified barriers either apply mainly or more severely to older women students who are returning to the educational system. The effects of these barriers are compounded by psychological factors such as the lack of self-confidence felt by many women, as well as the need many of them feel for assistance in reestablishing basic academic skills and in scheduling time (Brandenburg, 1974).

Continuing Education Programs

The last fifteen years have seen the development of an increasing number of continuing education programs for women (U.S. Department of Labor, 1974a). The goals of these continuing education programs for women have tended to be very broad (Berry and Loring, 1970). They include attempts to (1) strengthen society's view of what women can achieve, (2) improve the abilities and competencies of women so they even embark on second careers, (3) rebuild women's self-image and self-confidence, (4) help women resolve identity problems, and (5) educate all students and the community about changes in women's status.

To meet these goals, Berry and Loring have categorized the following areas in which programs have been developed:

1. Training or retraining to enter specific educational or occupational areas.
2. Personal enrichment.
3. Improving abilities necessary for community leadership.
4. Understanding of self and family.
5. Improvement or development of work or homemaking skills.

Some of the principal features of these continuing education programs include limited course loads in degree or nondegree programs; flexible scheduling of classes at convenient hours; liberal provision for transfer of credits; educational and employment counseling; financial assistance for part-time study, child care, and job placement or referral services. Each program may contain one or more of these features.

In many of the continuing education programs for women, curriculum innovations and new educational practices are being developed (Wells and Magruder, 1972). Men and women who desire a degree but do not satisfy regular classroom requirements constitute the student body for such programs.

Although a number of these programs have the principal objective of facilitating the reentry of women in specific occupations (such as teaching), programs aimed at such retraining appear to be in the minority. A number of other programs seem to be more generally concerned with helping women rejoin the labor market. But the foci of these programs vary widely and tend to be largely a function of the interest of those involved in developing and implementing the particular program (U.S. Department of Labor, 1974a). It seems unlikely that the heterogeneity of existing programs can be explained on the basis of differences in the needs of women in the relevant communities.

In 1971, the Women's Bureau of the U.S. Department of Labor published a report that briefly described 376 programs for adult women that were sponsored by colleges and universities. Although the available program descriptions published in this report are very succinct, a number of weaknesses are apparent:

- Geographic distribution is limited.
- Financial aid is rare.
- Few schools offer specific refresher courses.
- There was a lack of placement services in many programs.
- The programs listed seem to suffer a scarcity of financial resources and a paucity of staff.

SUMMARY

There is considerable evidence that the factors that induce greater labor force opportunities will continue to grow in the future. The growth of "women's jobs" and the atrophy of barriers to "men's jobs" both contribute to this phenomenon. In addition, a number of studies have focused on factors affecting labor force response, or participation rates.

However, once we go beyond the demographics of labor force activity, the literature becomes scarce. We know little about the process by which women manage their careers, role conflicts, and role sequences. Even the character of the career patterns is not known: How many mature women in the labor force are reentrants? How many enter for the first time in mid-life? What are the educational needs of those who enter and who fail to enter the labor force? How should one characterize existing and needed social resources?

In other words, the kind of research that would be the basis for improved social and educational supports for the management of the complex role sequences and role conflicts of mature women hardly has begun. Yet, as women become more numerous in the labor force, and as they seek to enter occupations that are more subject to knowledge obsolescence, the need for this information will grow.

The available data indicate a rather limited response on the part of educational institutions to the evolving educational needs of women. Programs are limited in number; they suffer from limited resources; and they vary widely in scope. Generally, the emerging programs do not appear to be guided by an analysis of the specific needs of women, in terms of labor market reentry and conflict between family and job roles. Nor have the programs been assessed in terms of their effectiveness in facilitating adjustment to technological change.

Programs for women may deserve more generous financial and institutional support. However, before urging greatly augmented efforts toward such programs, there is a need for research regarding the specific needs of women and the value of various types of programs.

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Chapter 5

PROBLEMS OF ADAPTATION AMONG THE ELDERLY

INTRODUCTION

In this section we examine the literature that is relevant to the problem of adaptation to rapid technological change among the elderly. Clearly, there is no nonarbitrary chronological definition of this target population. Aging occurs throughout the life cycle, and research subjects often do not report themselves to be old until at least age 80 (Bennett and Eckman, 1973). Nevertheless, it is common to take age 60 as a starting point for studying the process of growing old (e.g., Clark and Anderson, 1967). Within the role-theoretic framework of this project, the class of aging persons is most conveniently construed in social terms: Aging persons are those facing the relinquishment of *central* and *primary* "adult" roles (such as parent or productive worker) in transition to the status of "elder." Social norms require that relinquishment to occur by age 65, while encouraging an even earlier transition (Havighurst, 1973). So defined, approximately 9.9 percent of the U.S. population falls in the "aging" category (Viscusi and Zeckhauser, 1974).

The class of aging persons forms a substantial segment of the population, albeit one that has long been overlooked (Lawton, 1973; Gross, 1970; Lowenthal, 1971). It is only comparatively recently that aging persons have become visible to researchers and policymakers, an emergence accompanied by the recognition that the community has an as-yet unmet responsibility for creating conditions enabling older people to "lead the independent, mentally stimulating, and emotionally satisfying lives of which they are capable" (Jacobs et al., 1970; Eisdorfer and Lawton, 1973). This circumstance alone makes the present target population a constituency worthy of study, particularly since everyone is destined eventually to join it. However, it gains special interest in view of two additional considerations related to the issue of adaptation to rapid technological change: (1) First, the current cohort of aging persons has lived through a period of unprecedented acceleration in technological change (Caudill, 1958; Cassell, 1970); thus, they

comprise a key sample in which to look for the effect of such change on human functioning. (2) Further, facilitating adaptive responses to sociohistoric change among aging persons is of vital national importance, in light of the ongoing age shift in the population as a whole. Demographic research indicates that increasingly larger proportions of the population are to hold this status, intensifying the need for ameliorative social policies and programs (Neugarten and Moore, 1968). It is especially important that such steps are implemented effectively in time to accommodate the aging of the huge postwar cohort, from whose transition through adolescence to adult status the nation has not yet recovered.

For these reasons, then, aging persons have been designated a target population in the present study. However, it is expected that while the content of many adaptation problems will be specific to various demographic groups, their structure will be common across groups.

The major thesis suggested by this review of the literature is that rapid social and technological change "predisposes" elderly persons to stressful conditions. A "predisposing social system" is defined by Jaco (1970) as one which subjects individuals to a high frequency of stress, where they often are faced with environmental demands for which their present resource levels are inadequate. Such a social system would predispose individuals to maladaptive outcomes. In our model of adaptation, the amount of system-generated stress is a function of how feasible and costly it becomes to maintain a specified level of effectiveness in activities relevant to a role, plus how basic these activities are in relation to role maintenance.

That conditions of rapid social change are, in fact, predisposing for most persons has been suggested by many sources. Durkheim (1951), for example, linked anomic suicide to conditions of normlessness occurring during times of rapid economic change. More recent studies have shown significant associations between psychiatric impairment and "changes in the respondent's social field," particularly those involving social disintegration, role dissolution, and decrease in control over life events (Myers et al., 1971; Smith, 1971; Srole, 1956; Jaco, 1970). Finally, even physical health has been negatively influenced:

"During the period of rapid cultural change in the western world in recent years, it often has been suggested that the upsurge of degenerative illnesses is related to cultural and social factors" (Caudill, 1958). Such conditions, however, have special effects on aging persons.

It can be concluded that current conditions of rapid change result in environmental demands that threaten the adaptive capacities of older persons, particulary when these processes are decremental in nature. Moreover, among older persons, the ability to influence the incidence of environmental demands is reduced. Thus, the present system is highly predisposing for the aging population.

ROLE RELEVANT KNOWLEDGE AND RESOURCES

The model of adaptation identifies role-relevant knowledge and resources as important determinants of the level of performance that can be achieved by role incumbents. The most prevalent assumption regarding older persons is that they tend to suffer reduced competence, because of the "natural" effect of aging (Lawton, 1973; Gottesman et al., 1973; Neugarten, 1968). Because this assumption, which we think to be largely erroneous, has important implications for the kinds of educational interventions ultimately regarded as feasible, a review of the response capabilities of aging persons is worthwhile.

Recent studies of the effectiveness of aging persons in dealing with information have consistently found adverse age effects in the performance of many types of *paced tasks* (Eisdorfer et al., 1963; Eisdorfer, 1968; Canestrari, 1963; Arenberg, 1965; Monge and Hultsch, 1971; Birren, 1970; Botwinick, 1965; Riegel, 1965; Jarvik and Cohen, 1973). Birren's 1970 overview of experimental gerontology emphasizes that "slowness of behavior is the independent variable that sets limits for the older person in such processes as memory, perception, and problem-solving." These limits seem to be primarily psychomotor in nature rather than cognitive--not reflecting an incapacity to remember, learn, and problem-solve, but rather an inability to deal with performance conditions (conditions surrounding stimulus presentation and response requirements). Although pacing of inputs affects adequacy of information processing across age groups, *pacing of responses* is seen

as critical in the performance of older persons. In rapid response situations, aging persons make significantly more errors in a variety of cognitive tasks than younger persons; similarly, increasing time to respond or leaving response time open-ended benefits older respondents far more than younger ones (Arenberg, 1973; Jarvik and Cohen, 1973).

Attention and memory span comprise another area in which systematic age-related effects have been established. Contrary to age stereotypes, healthy older persons do not exhibit a decline relative to younger persons in attention or immediate memory in cognitive tasks (Thompson and Marsch, 1973; Talland, 1965; Craik, 1968). However, as soon as inputs for a cognitive task exceed the span of immediate memory (i.e., exceed approximately 7 bits of information), performance of older subjects shows a decline relative to that of younger subjects, and the discrepancy increases with the number of inputs. A series of experimental investigations (reviewed in Arenberg, 1973) converge on the conclusion that age deficits do not result from registration difficulties alone, or from storage and retrieval difficulties alone, but rather from attempts to perform both sets of operations together. When responses are required from older persons, additional information tends to inhibit search and retrieval of problem-related material once the domain of immediate memory has been exceeded.

A third area of investigation concerns results of standardized intelligence testing. It has been established that elderly persons do less well than younger persons (i.e., persons age 50 or below); however, both the interpretation and significance of these findings are problematic (Kimmel, 1974; Rhudick, 1963). Most studies (e.g., Pierce, 1967) find that performance on intelligence tests is very strongly correlated with level of education. Attempts to break down factors contributing to declines in scores on intelligence tests have yielded remarkably consistent results: Lowered total test scores are associated with "performance" subtests, that is, tests that require manipulation of materials such as object assembly or digit-symbol substitution (e.g., Kimmel, 1974; Rhudick, 1963; Birren, 1964). In contrast, verbal and quantitative subtest scores remain unimpaired. Writers speculate that the *time constraints* on a manipulative problem-solving task are responsible for the decline on performance subtests, because they have

determined that aging persons require more time and slower pacing for such responses. But by and large, the consensus from research sources is that the alleged decline in intellectual functioning in older persons is primarily attributable to limited education, economic plight, poor health, and social isolation, rather than to variables intrinsically related to age (Eisdorfer and Lawton, 1973; Baltes and Labouvie, 1973; Gottesman et al., 1973; Pierce, 1967).

Another important factor affecting intellectual functioning is *flexibility*. The elderly often are thought to have become more rigid as they age; but an extensive review of studies of flexibility/rigidity finds results to be quite inconclusive and inconsistent: There is no clear evidence that older people are either more rigid or more conforming than younger ones (Bennett and Eckman, 1973). Meanwhile, evidence from studies conducted by Gurland (1973) and Lowenthal and Chiriboga (1973) indicates that obsessive or compulsive persons rigidly adhering to old routines actually may fare better during such role-loss periods as retirement. Besides flexibility, numerous other socioemotional variables have received attention, although none has the face validity of flexibility as a predictor of adaptiveness to change.

A third personal quality related to response capability among aging persons is physical health. Physical well-being clearly is an important resource relative to adaptability, and has also been implicated in studies of cognitive resources (Kimmel, 1974; Pierce, 1967; Clark and Anderson, 1967). A review of the physical parameters of aging would go well beyond the scope of the present investigation, although there is a plethora of research in that area (e.g., Birren et al., 1963). From the viewpoint of this investigation, a major effect of recent technological change has been the extension of the normal life span, resulting in an ever larger population of aging persons (Kimmel, 1974; Comfort, 1968). Such persons are more susceptible to impairing conditions, and the overwhelming majority of them have one or more chronic illnesses (Troll, 1971; Krehl, 1974).

However, it is generally concluded that the effect of changes in health status on functioning among the elderly is seriously overestimated--the performance of the elderly is more constricted by

societal limitations and underdemand, so that activities tend to fall far short of physical capability (Gottesman et al., 1973). It is this very circumstance--a growing population of aging persons undergoing a series of social role losses so that resources exceed opportunities for desired activity--that is responsible for a large share of adaptive difficulties. In the language of our model of adaptation, we have here an exogenously imposed restriction in the elements of role repertoires and the consequent decrease in individual satisfaction.

Attention to personal resources among aging persons has yielded no set of severe impairments intrinsic to the elder status. Rather, our review suggests that aging persons are in principle capable of adapting successfully to contemporary change; there are no vast unbridgeable differences between them and younger cohorts. In fact, it begins to seem that age-related differences in social and environmental opportunities could play a major part in adaptability. Thus, it will be advantageous now to inquire into social resources among the aged.

SOCIAL ASSE

Income

For most wage earners, the transition from work to retirement has been completed by age 65, a transition frequently associated with a precipitous decline in money income. It has been estimated that one-third of the aged have incomes below poverty lines (Young, 1974; Watkins, 1972; Troll, 1971; Pelcovits, 1971). Further, data from the 1960s show that individual incomes of the elderly are depressed in comparison with those of younger individuals (e.g., median family income for a family whose head is 65 or older is only 46 percent of the median family income for families headed by younger persons); the data also indicate that this income discrepancy between the elderly and nonelderly is increasing (Brotman, 1967; *Business Week*, 1971).

Aggravating this situation is the increased per capita output, associated with rapid technological change, which gives rise to a secular decline in the *relative* incomes of retired persons (*Business Week*, 1971). Inflation further exacerbates the plight of those living on

fixed incomes. For these reasons, the Senate Select Committee on Nutrition and Human Needs has identified the elderly as a segment of the population that is especially vulnerable to a fixed-income squeeze during a time of rising prices. Technological change also has induced gradually lower retirement ages and a longer life span, thereby attenuating the retirement period and worsening the relative income position of the older cohorts of retired persons.

Finally, most older persons, for the first time in their life cycle, are coping with *downward socioeconomic mobility* (Brotman, 1967). But as income decreases, price becomes a more important variable in all sorts of everyday decisions (Howard and Sheth, 1969). Moreover, the adjustment of aspiration level is a very slow process, making the discrepancy between income and aspiration especially frustrating for those who are undergoing an income decline as described above (Cassady and Jones, 1951; Mueller, 1958). Recent increases in the benefit levels in the Social Security system, and especially the development of Supplemental Social Security Income benefits (SSI), have been effective in improving the income positions of the elderly. Yet the relatively lesser economic resources commanded by aging persons continues to reduce their ability to control and adapt to their environment.

Social Roles

Examining the resource subset referred to here as "social assets" yields a conclusion contrasting sharply with that drawn from the discussion of intellectual functioning. That is, social resources diminish seriously with advancing age, and their depletion poses a serious threat to adaptability. Thus, although a rapidly changing environment is particularly demanding for aging persons, social support for that age group is especially lacking. Almost all of the sources we have consulted invoke role loss as an etiological factor in adaptive problems among the elderly. Rapid sociocultural change is the hypothesized antecedent of role loss for aging persons, and psychological impairment a frequently cited outcome.

Havighurst's (1973) naturalistic observation data suggest that among adults, 90 percent of their waking hours are spent in one or

another social role. Thus, in treating an individual--for the purposes of this review--as defined by the set of roles performed, we have not generated an abstraction that seriously distorts reality. The set of roles performed, or the total role repertoire, may further be subdivided into three major categories (Havighurst, 1973; and Clark and Anderson, 1967, employ basically the same role categories but combine the second and third):

1. *Family* roles (ascribed) include spouse, parent, homemaker, grandparent, adult child of aging parent, and the like.
2. *Work* typically only includes one role, namely, the worker role; however, because this role is so important and so pervasive, having so many ramifications, it determines a fairly complex behavior category.
3. *Community* roles, such as work roles, are achieved; they include association membership, citizenship, friendship or neighborhood or informal social relations, church membership, and the like.

Characteristic role clusters, or patterns of correlation among specific roles in the categories above, can be used to describe life-styles of individuals or groups of individuals.

The conclusion from both large-scale empirical investigations as well as from detailed case studies is that with age the absolute value of all correlations between role performances and personal resources decreases because of a social denial of access to central roles and a concomitant drop in the overall level of role activity (Rosow, 1974; Havighurst, 1973; Clark and Anderson, 1967; Neugarten, 1973; Gurland, 1973; Caudill, 1958). That is, time-dependent losses of central roles in the family, work, and community categories characterize the status of aging persons. These losses are not a function of the deterioration of personal competence with age, but rather are seen as an effect of technological change over time in the context of declining social assets as suggested above. Moreover, this loss in the "capitalized value" of role repertoire among the elderly seems to be involuntary, socially

imposed, and inconsistent with the desires and personal resources of older people. As the adaptation model predicts, these conditions result in negative affect, being strongly correlated with lower self-esteem and morale as well as increased incidence of physical and psychosocial dysfunction (Clark and Anderson, 1967). Further, our review suggests that rapid technological change (especially, industrialization and urbanization) is a major factor in explaining the generation of these outcomes.

The Elderly as Consumers

There is evidence that the elderly may suffer a deterioration of competence in the consumer role as a result of rapid technological change and the associated proliferation of products and product information. Although coping with too many inputs tends to produce dysfunctional consequences on both consumer decisionmaking and behavior across age groups, the literature indicates that factors associated with age tend to reduce the pace of cognitive processing for older persons. One way that people alleviate the problems associated with the cognitive change is simply to *routinize responses to the choice situation*, adhering consistently to the same decision criteria and preference rankings (Howard and Sheth, 1969; Gross, 1970). Two considerations, however, mitigate against this strategy. First, at the rate that new products enter the market, such routinization would be hard to achieve. Among consumer products purchased in 1964, two-thirds were not on the market in 1954 (Buzzell and Nourse, 1967), and the rate of proliferation has continued to increase (Zedek et al., 1974). Thus, routinization could only be achieved by ignoring new products and remaining loyal to old preferences. Second, if such a routinization strategy could be implemented, it might prove especially detrimental to older persons to the extent that it prevents them from taking advantage of the benefits of technological innovation.

Because rapid technological change creates conditions that might benefit the nutritional status of aging persons if they could maintain consumer decisionmaking skills, it seems desirable to attempt educational intervention in this area. Similar conclusions could doubtless be drawn regarding the prevention of obsolescence in other noncentral

roles (e.g., obtaining social and medical services, housekeeping, or transportation), which surely suffer the same sorts of adaptational difficulties.

THE EDUCATIONAL SYSTEM AND ADAPTATION PROBLEMS AMONG THE AGING

In the preceding sections, we suggested that rapid technological and social changes have resulted in obsolescence within roles and the loss of roles among the aging. Moreover, we have argued that such time-dependent losses in effectiveness of role activity, and of role access, are not caused primarily by changes in individuals associated with biological aging. Rather, these losses are associated with a host of environmental changes, the majority of which seem to disfavor the aged (Gottesman et al., 1973; Gurland, 1973). Finally, surveying the social origin and extensive magnitude of the stress/press has led us to conclude that social solutions are warranted. That is, individual efforts to augment resources may be successful in some cases; but individual resolution of problematic situations will fail to remedy the adaptation problems faced by the great majority of aged persons. We therefore maintain that, rather than encouraging individual initiative in problem-solving, ameliorative efforts should focus on developing large-scale interventions aimed at augmenting the social resources of aging persons (MacLean, 1974; Lawton, 1973). Such efforts are within the province of educational institutions.

Education's potential for developing the aging as a social resource while facilitating individual adaptation to change was envisioned by McClusky, co-chairman of the White House Conference on Aging, in his statement of educational issues (1971):

> for persons in the later years, change gives rise to a "double jeopardy." That is, the changes in the society surrounding the individual compound the readjustment induced by the age-related changes occurring within the individual. Thus, if education is to be relevant for the unique situation of the older person, and, moreover, if it is to be effective, it must without compromise deal with the multiple impact of change. . . . But for more fundamental and ultimate purposes, society's stake in the education of older persons is that of helping them become a more effective resource for the improvement and enrichment of society itself. In the context of this view, education for older persons is an investment in resource development.

Our review of relevant literature provides good reason to believe that educational systems are now ready to undertake the task of providing programs to the elderly. During the past twenty years, new and encouraging data about the learning abilities of older people have become available that enable educators and policymakers to proceed on the assumption that this population is capable of responding constructively to educational interventions (Mason, 1974; Peterson, 1974). There is, then, growing acceptance of the thesis that adaptation to change among the elderly can be facilitated by educative processes.

Correlation of Age and Education

As the Census Bureau data given in Table 5.1 indicate, age varies inversely with years of formal education completed. The age-education correlation clearly is most serious for persons 65 and over, half of them having received no training beyond grammar school. This population, which includes an estimated three million or more functional illiterates,

Table 5.1

CORRELATION OF AGE AND EDUCATION

(March 1972)

	Years of School Completed (% distribution)							
	Elementary School			High School		College		Median School
Age	Less Than 5 Years	5-7 Years	8 Years	1-3 Years	4 Years	1-3 Years	4 or More Years	Years Completed
25-29	0.8	2.7	3.1	13.6	43.8	17.1	19.0	12.7
30-34	1.4	3.4	4.7	16.7	43.9	13.6	16.5	12.5
35-44	2.5	5.4	6.9	18.5	41.5	11.5	14.7	12.4
45-54	3.4	7.3	10.8	18.6	38.6	10.6	10.7	12.3
55-64	5.6	11.6	17.3	18.9	29.3	8.5	8.8	11.3
65-74	9.9	16.0	23.6	15.3	20.1	7.2	7.8	9.1
75 and over	16.0	18.3	27.1	11.8	15.2	6.1	5.6	8.6

SOURCE: U.S. Bureau of the Census, *Current Population Reports*, Series P-20, No. 243, "Educational Attainment: March 1972," U.S. Government Printing Office, Washington, D.C., 1972.

should be viewed as significantly undereducated (Peterson, 1974; Schaie, 1973). Moreover, even among those less deficient in years of schooling, the quality and effectiveness of education a half-century ago must be taken into account. "With teachers who were ill trained, materials which were scarce if available at all, a curriculum which deviated little from the three Rs . . . it probably is not accurate to equate a year of schooling in the early 1900s with a year today" (Peterson, 1974). When to this consideration is added the recognition that specific strategic knowledge or skills imparted to older individuals during that period would surely have become obsolescent, it seems likely that the formal "preparatory" education of the elderly has in fact left them much less prepared than younger generations to meet environmental demands (Baltes and Labouvie, 1973; Riley and Foner, 1968; Rosow, 1974).

Table 5.2 shows a significant inverse correlation between age and participation in adult education, the percentage of enrollments among the eligible declining sharply after age 45. Although the underrepresentation of older persons in adult education has been widely documented (Peterson, 1974; Mason, 1974; Havighurst, 1973; Johnstone and Rivers, 1965), it has not been adequately explained. Nevertheless, in a society in which learning has become an essential condition for effective

Table 5.2

PARTICIPANTS IN ADULT EDUCATION AS A PERCENTAGE OF THE TOTAL POPULATION BY AGE, UNITED STATES, MAY 1969

Age	Population in Each Age Group (in millions)	Percentage Who Participated in Adult Education
17-24	24.8	18.0
25-34	23.6	18.2
35-44	22.7	13.5
45-54	22.7	9.4
55-64	17.9	4.5
65 and over	18.6	1.6

SOURCE: U.S. Department of Health, Education, and Welfare, National Center for Educational Statistics, *Participation in Adult Education: Initial Report, 1969*, U.S. Government Printing Office, Washington, D.C., 1971.

participation in the rapidly changing environment as well as for continued personal development, it is vital to the well-being of older persons to develop engaging educational programs.

Recommendations for Education among the Elderly

Changing the Status Quo. Paradoxically, considering the existing state of affairs, the "solution" seems to be part of the problem. That is, there are a great many potential instructional sources, and we seem to be recommending that there should be better programs and more participation. Suppose that aging individuals regarded continuous participation in the learning process as characteristic of the normal life span, and suppose that in particular they felt educational programs were especially relevant to living in a complex and changing environment while managing the developmental tasks of aging. In such a climate, offering more and better programs would undoubtedly increase the participation of aging individuals. However, part of the problem is that aging individuals do not view themselves in this light. They are alienated from social processes and, as the discussion of role obsolescence suggested, they do not envision meaningful social statuses that they can hold that give rise to roles whose successful enactment would be facilitated by participation in a learning process. Another part of the problem is that educators do not view older people in this light. We have pointed out in another chapter that roles attach to social positions, not to persons. That is, appropriate role behaviors are in large measure defined by social expectations, conventions, and evaluations. Now suppose that society in general, and educators in particular, demanded that older people occupy meaningful social statuses and expected them to be a continuous part of the educative process in order to enact effectively the roles assigned to them. Under such conditions, more and better programs would undoubtedly be developed because educators would regard the aging as an appropriate or "regular" part of their clientele and would make increased efforts to engage them. But at present, learning for the elderly does not seem to be construed as integral to the functioning of educational institutions either by the elderly, by the educators, or by society generally.

As we see it, this state of affairs is a reflection of the overall role loss experienced by aging persons and is the substance of claims that educational programs for such persons are beset by problems of "relevance" and "motivation" (e.g., Hiemstra, 1972; Peterson, 1971, 1974; Knowles, 1970; Mason, 1974). The seeming lack of relevance and motivation is, we think, symptomatic of the ambiguous social status of aging persons. Inquiring whether older people can fit comfortably into the role of student in adult education programs, Havighurst (1973) comments that "many of these programs and projects looked very good when they were operating, and the people involved as students and teachers felt that they were successful. But few of these programs 'took hold' and became institutionalized." An explanation can be drawn directly from Havighurst's own cross-national study of role performance among the elderly, where he concludes that a life-style is a result of the situation that a society maintains (Havighurst et al., 1969). Currently, urban industrial society does not maintain a situation in which education is a meaningful part of the life-styles associated with aging; as we have shown, the single most important life-style change that accompanies aging is the loss of socially valued work across role categories. It is for this reason that we have contended that individual efforts to augment knowledge and other resources by finding and taking some available courses do not go far toward alleviating the more general adaptation problems facing the aged. Similarly, we think it infeasible to leave the impetus for participation in learning processes up to self-initiated searches by the elderly for meaningful programs. Rather, a social solution initiated by educators and policymakers, one that orients educational processes toward developmental tasks facing the aged in the changing contemporary environment, is required.

General Recommendations. The first recommendation we have to make, then, concerns "consciousness raising," "attitude changing," or some means of instilling in the elderly, the educators, and the general public a new conception of adaptive problems facing the aging and their capacity to respond constructively to educative procedures. This recommendation involves disseminating research findings on the relatively unimpaired learning abilities of older people, together with a comprehensive picture of their needs and a decision that public educational

institutions should be instrumental in meeting them. According to Peterson (1974):

> In the final analysis, the greatest educational barrier that older people must overcome lies in the minds of adult educators. It consists of the stereotypes, folk-wisdom, and ignorance which labels senior citizens as unworthy clients for the field of adult education. . . . A basic philosophical change must be attained that will include an awareness of the needs and interests of the older group, an appreciation of their diversity, a belief in their potential, and a commitment to work cooperatively with them in order to overcome their problems and facilitate their growth.

A similar view has been expressed by the American Psychological Association's Task Force on Aging (1973).

At the same time, however, it is necessary to overcome comparable barriers in the minds of aging individuals, who have internalized the negative social attitudes described by Peterson (Bennett and Eckman, 1973; Gottesman et al., 1973). With these barriers weakened, the way is open for older people to become conscious of themselves as a group and to form alliances to help bring about change. Kobasy (1974) points out that the elderly comprise one of the largest minority groups in the nation, and certainly the most rapidly growing group. He contends that "the prognosis for expanded opportunity lies with the elderly becoming a more cohesive group willing to organize for their rights and to take advantage of their numbers and financial power." Kobasy apparently thinks that action to increase learning programs must await such efforts from older persons. But in view of what we have learned about the current social power of the aging, we think it unwise to depend on their demands to initiate changes in educational institutions. The excellent theoretically developed study of political consciousness of the aged by Ragan and Dowd (1974) concludes that "age is not yet a salient political referent for most older people," the aged having "no effective political organization which may become a focal point for any future social movement, recruitment and mobilization" (cf. Trela, 1973; Binstock, 1972). Nevertheless, Ragan and Dowd's generational analyses suggest this is a cohort effect rather than an age

effect and imply that within the next decade the elderly will emerge as a much more cohesive and powerful political force. In the meantime it is desirable that educational institutions act now to change their stance regarding learning processes and the aged, in the interest of alleviating present needs and anticipating future demands.

Our second recommendation concerns the most fruitful place to begin such changes. We have suggested that the idea of education as preparatory is gradually being replaced with the idea of education as a way of meeting the objectives of the present, a revision largely brought about by rapid technological change; it is no longer possible to prepare to deal effectively with the environment 10 or 20 years in advance. This revision entails the view of education as continuous and should eventually affect the orientation of all educational institutions. At present, however, our review indicates that community schools, colleges, and junior colleges provide the most viable starting points for expanded learning opportunities for the elderly. The survey of instructional sources indicated that although the concept of education for older people is generally accepted and many limited program attempts have been made, nothing has "taken hold." That is, there seems to be a breakdown somewhere between the implementation of the concept and its incorporation into the regular life of the institution and the potential clients.

Our search for factors that are likely to promote incorporation was guided by the recent comprehensive study of factors supporting educational change by Berman and McLaughlin (1975). Attempting to isolate conditions that lead to the institutionalization of educational innovations, they draw the following conclusions:

1. Federal policies and federal funds influence only the initial interest in and adoption of programs in areas of federal concern; they have little effect on program continuation or program outcomes.
2. Educational treatment or technology per se has little influence on effective implementation of innovative programs.
3. The local institutional setting has a major effect on long-term outcomes, and a receptive organizational climate and commitment

on the part of the individuals involved are necessary conditions for the successful incorporation of an innovation.

4. Features related to the scope and nature of the change and to the implementation strategy were critical conditions for incorporation. The following descriptions characterize successful efforts:
   - If a change is perceived as central to the institution's priorities (rather than ancillary) and instrumental to its own proper functioning, it is likely to continue.
   - If the values and goals implicit in a project's design are consonant with those of the project's participants, the likelihood of institutionalization is increased.
   - If programs require changes in institutional behavior, such changes must be integrated into ongoing institutional activities.
   - Program planning must be flexible and adaptive.
   - Staff training and development of program materials must be keyed to the local setting.

The review of instructional sources suggested that only community organizations and community schools, colleges, and junior colleges currently manifest the conditions conducive to successful incorporation of learning programs for the elderly. But community organizations are not staffed or structured to take on primarily educative functions. Community schools, colleges, and junior colleges, like other community organizations, seem to be receptive to the needs of the elderly, regarding adult education as centrally related to their institutional priorities and goals. Further, they seem able to gear program plans to local interests, often engaging the aging constituency in program development. Consequently, we think policies and funding to encourage expanded learning opportunities for older persons in formal educational institutions would most fruitfully begin at the level of community schools, colleges, and junior colleges.

The last area of general recommendations we have to make concerns educational practices which, based on our review of resources among

aging persons, we think will encourage and maintain their participation in learning programs. Most of these are pedagogical and reflect a strategy suggested by Arenberg (1973; Arenberg and Robertson, 1974). If age-related differences in cognitive performance have been identified, according to Arenberg, it makes sense to inquire what treatment variables influence the size of such differences; any treatment variables that are both influential and manipulable should be incorporated into teaching practices. Our review of cognitive resources among the elderly turned up no age-related differences in attention, immediate memory, or straightforward concept formation tasks; cognitive performance discrepancies instead typically occurred in situations requiring more extensive information management. Where information to be processed exceeds the capacity of primary attention and memory, *rate variables* have a broad and significant effect on age-related performance differences. Pacing of inputs is one such variable, older persons seemingly requiring longer inspection intervals. Even more important is pacing of outputs, older persons needing more time to respond in information processing tasks. It was hypothesized that pacing is important not only in relation to cognitive functions (e.g., time for organized storage and effective retrieval strategies) but also in relation to noncognitive factors such as arousal and anxiety. In any case, it is clear that any materials to be learned by older people should be presented at a relaxed pace--and may well be best learned when self-paced.

Age-related differences seem also to arise in information storage and retrieval processes. Such processes appear to depend heavily on data control strategies rather than on in-built structural features of the cognitive system; consequently, they are susceptible to modification by experience and instruction. *Storage* is importantly affected by the meaningfulness and organization of the material to be stored, particularly among the aging. It has been found that specific instructions about using organizational techniques improved learning for older persons (Arenberg and Robertson, 1974). Recoding and chunking of material to be learned along with the employment of mediational devices (e.g., associations, outlines, and the like) are among techniques thought to be helpful in this regard (see Miller, 1956). In contrast,

presentation of extensive arrays of unordered information to be retained passively by rote rather than actively by conscious management of inputting strategies is likely to be both ineffective and discouraging among older learners. *Retrieval* of stored materials, the process most seriously influenced by age, is, of course, assisted by effective organization procedures that facilitate subsequent access. Further, retrieval processes such as storage processes are improved by instructional methods that give explicit attention to the problem. For example, general mnemonic techniques can be taught. In addition, for every specific set of contents to be learned, a good retrieval plan should be included as well. Overlearning of retrieval plans is recommended. Moreover, training should be offered directly in the areas of heuristic strategies, information processing, and problem-solving (Baltes and Labouvie, 1973; Arenberg and Robertson, 1974).

A final age-related difference bearing on cognitive performance is the degree of arousal and/or anxiety these formal instructional situations evoke. It has been seen that for older people cognitively demanding situations give rise to a level of arousal or anxiety that debilitates response capabilities. Presumably, the practices described above would alleviate cognitive strain in the educational environment, thereby making that environment a less threatening one. Other practices would also go far to make that environment more supportive, as many sources have noted. For example, it would be well to eliminate formal evaluation whenever possible; when testing is necessary, the form of the test should be compatible with the retrieval strategies of older people--recognition tests being thus preferable to recall tests, and the latter most felicitously used along with retrieval cues (Arenberg and Robertson, 1974). And it would be desirable to eliminate competitive achievement in favor of cooperative learning practices (Peterson, 1974). Permissive open discussion methods and reliance on participant learning are recommended (Kauffman and Luby, 1974; Hunter, 1974). In sum, learning is easiest for older people in environments that de-emphasize elements of formal academic institutions and rely instead on more informal group processes.

Finally, problems of access to programs that were cited in the review of existing adult education for the elderly must be solved.

First, recruitment efforts comparable with those made to secure the educational participation of other minorities must be made in relation to older persons. Second, location, transportation, and scheduling must reflect the needs of various segments of the elderly who differ in degree of mobility. Bookmobiles and mobile classrooms, for instance, have been suggested to reach the confined (Clark and Anderson, 1967; Maust, 1973). Moreover, financing of education for aging individuals cannot be borne by those individuals; access should not depend on ability to pay (Peterson, 1974; Cohen, 1974; Kobasy, 1974; Hiemstra, 1972). It seems likely that responses to these and other unanticipated problems of access would be most adequately formulated if older persons were included in program planning and development.

The design and implementation of educational programs for the elderly guided by our recommendations would, we think, go far to improve the level of participation and distribute the benefits of continuous learning. We concur with Baltes and Labouvie (1973) who conclude their study of adult development of intellectual performance with the comment, "It is our belief that a concerted program of intervention will allow us to control large segments of intellectual aging to a greater degree than is commonly supposed."

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